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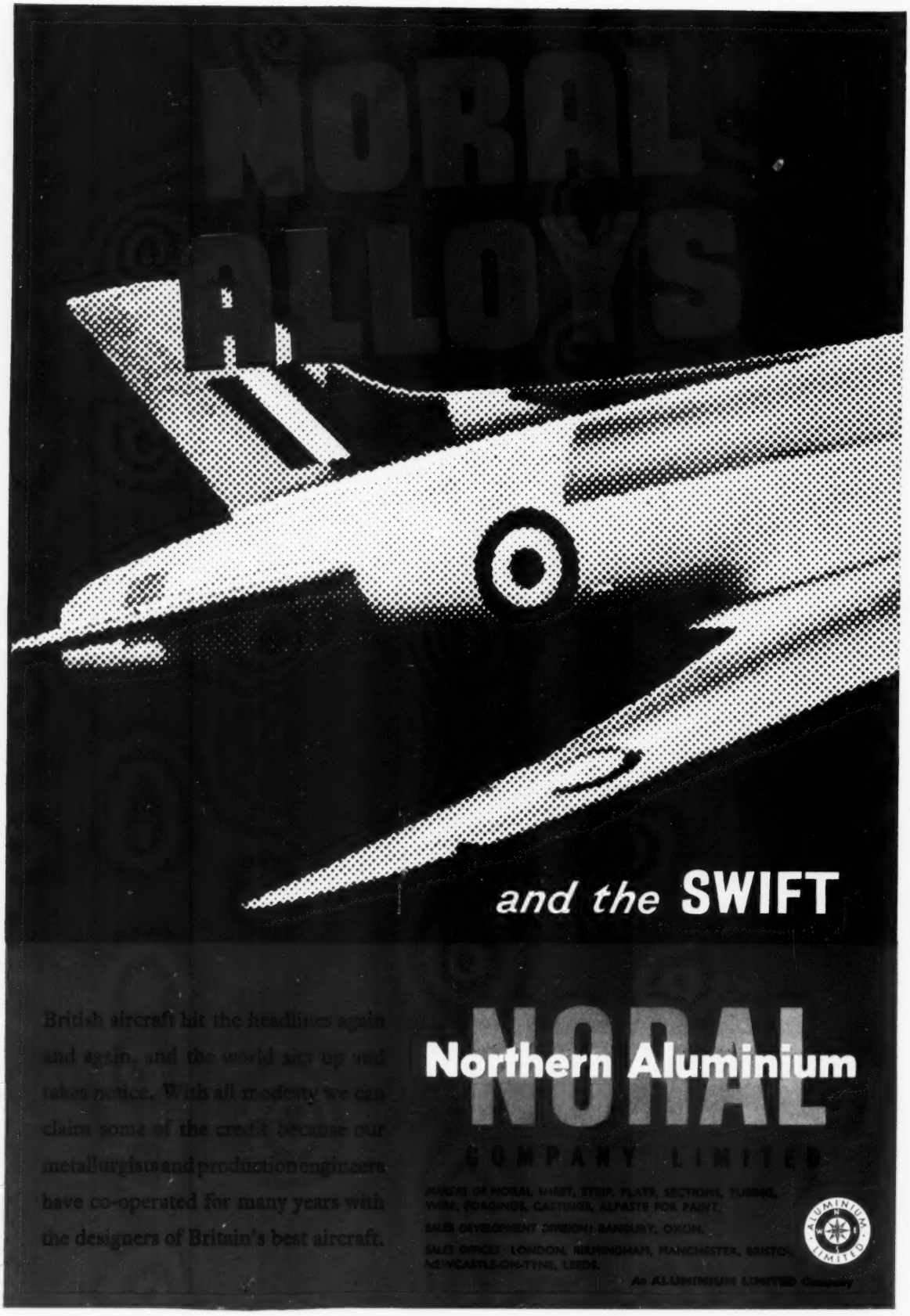

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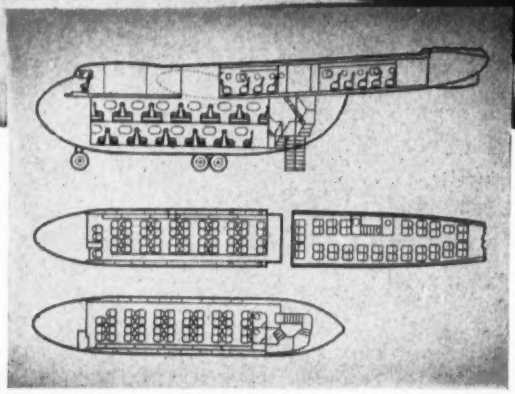

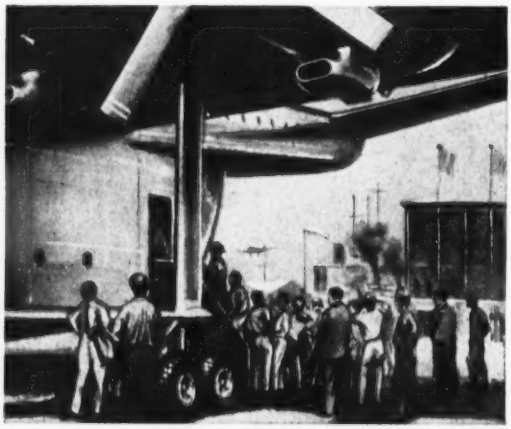

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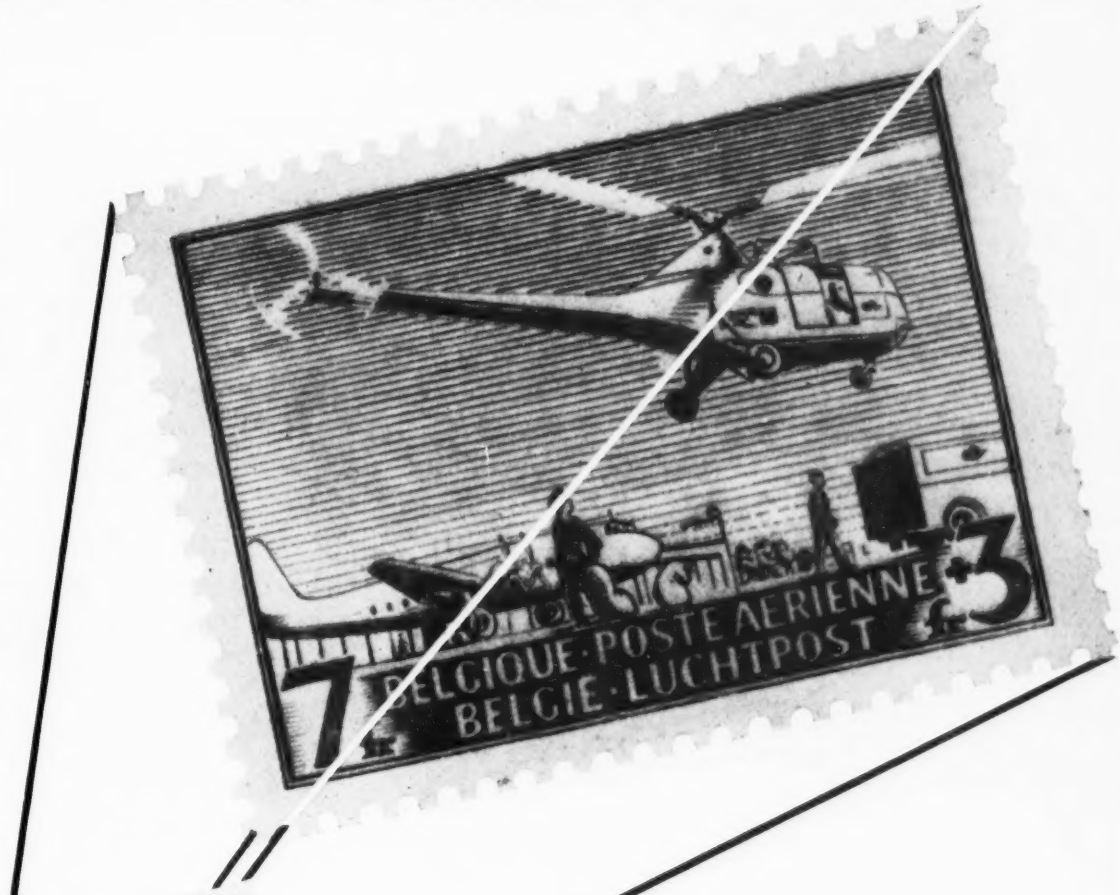

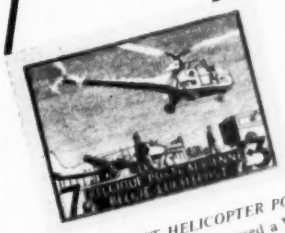

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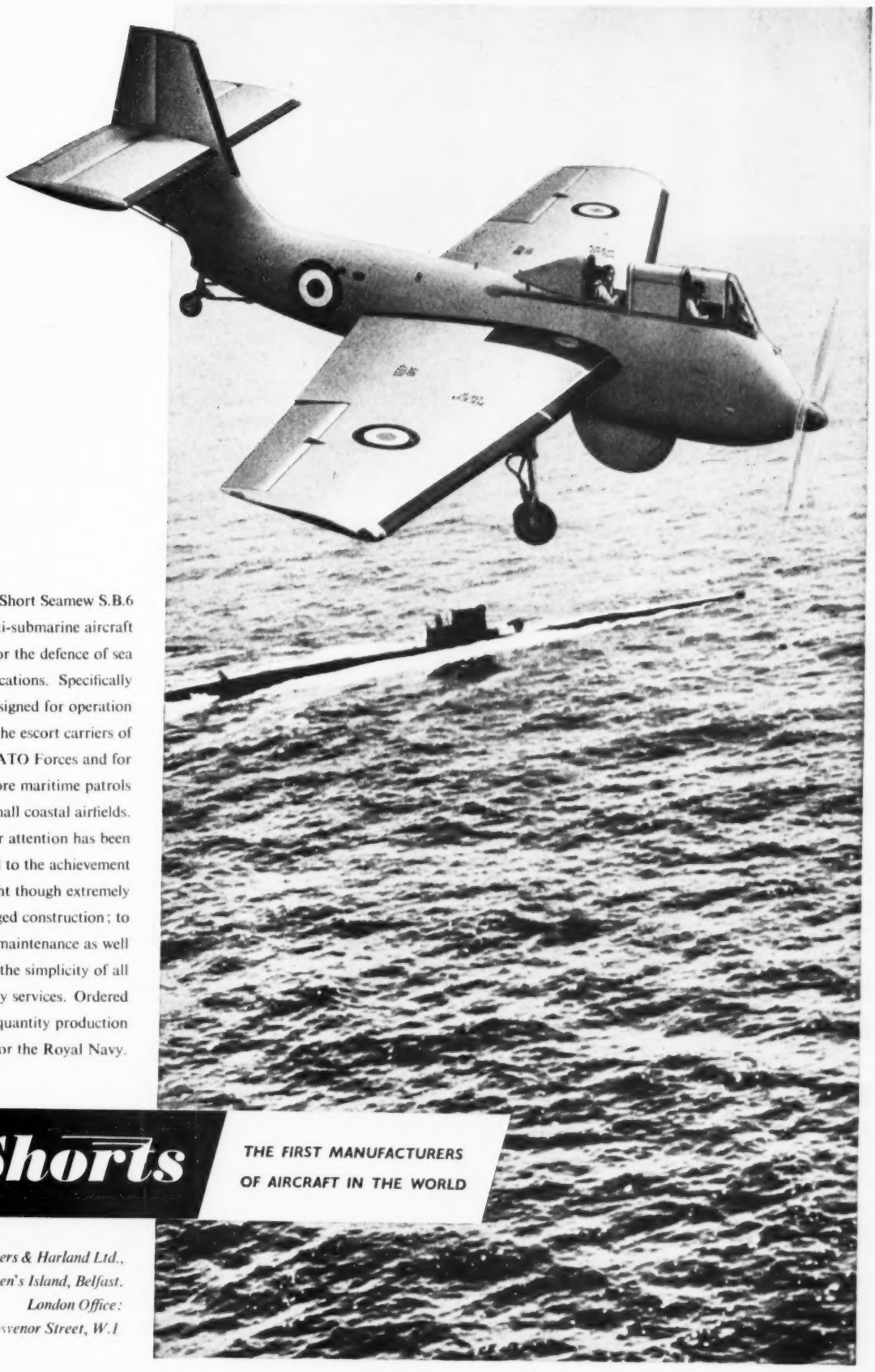

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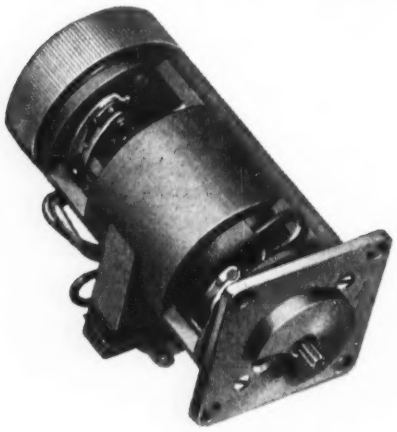

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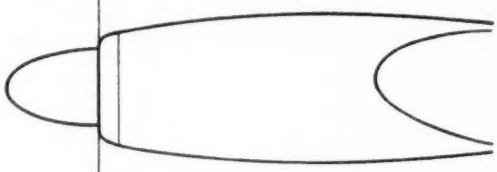

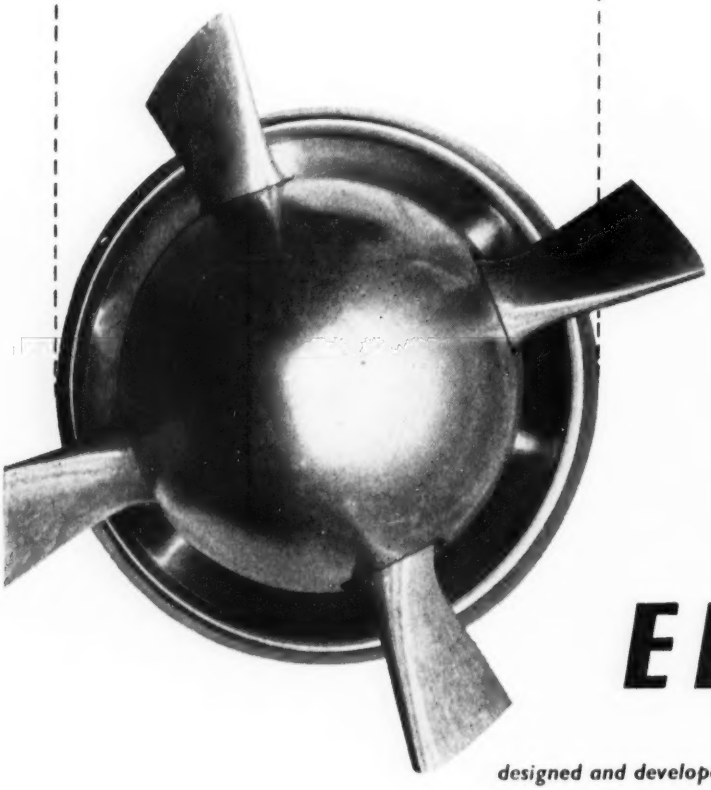

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To See or Not to See?

A COLLISION in the air can be particularly terrible in its consequences and profoundly shocking to any who witness it. Fortunately, very few occurrences of this kind have involved airliners. But if repetitions are humanly avoidable they must be prevented.

The Americans are particularly conscious of the risk of collision in the congested "aireas" above their major cities. They are still talking of the miraculous escape last August of two Convairs which, in spite of sustaining severe damage in a collision at 11,000ft over Michigan City, Indiana, managed to land safely. London Airport has had its near misses, too.

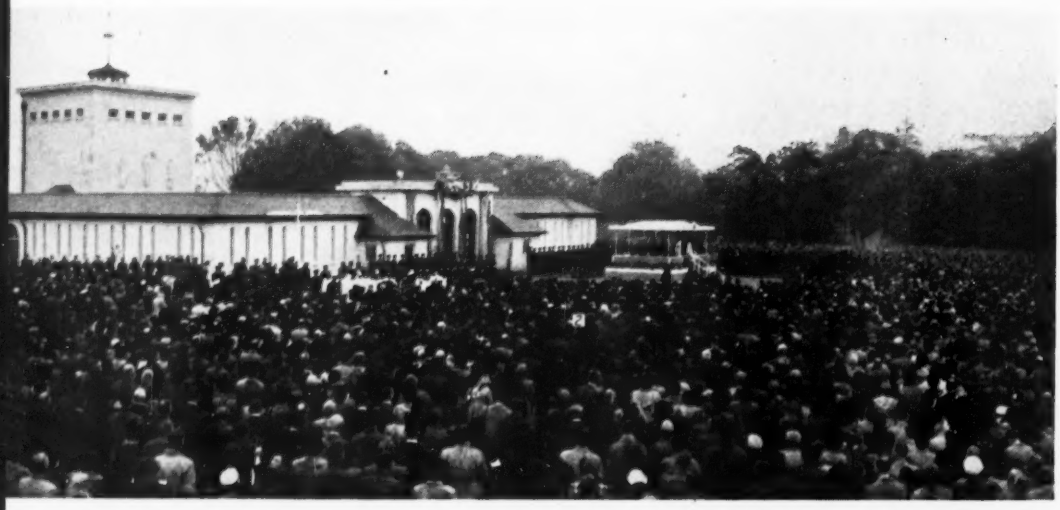
In this connection an American correspondent has written to us regarding pilot's vision —or the lack of it—from modern transport aircraft. But we are not convinced that better vision is going to provide more than a fraction of the answer. At some time in the fairly near future designers will have to discard conventional ideas on this subject. And we do not believe that the pilots of space-ships will be able to rely on forward visibility. Perhaps development of the ingenious scheme employed on the Republic Rainbow of the late 1940s may offer possibilities for the future. The nose of this aircraft consisted of a curved outer screen, transparent and conforming with the unbroken lines of the fuselage. For landing or take-off the screen retracted in two sections into the lower part of the nose, exposing a large flat main screen which gave an excellent forward view. But this still did not solve the problem of look-out in other directions.

The A.R.B.'s civil airworthiness requirements dealing with pilot vision are not very specific; they lay down in broad terms that the pilot shall be afforded a sufficiently extensive, clear and undistorted field of vision as to permit safe operation of the aircraft, and some notes on glare and reflections follow. In practice, vision varies within wide limits according to aircraft attitude and is at its worst—through just the arc the pilot wants to scan—when the machine is banked for a turn. Again, most airliners, certainly in European skies, are flown blind for at least half their working hours. Good look-out can be of little avail in cloud or bad weather. Visual Flight Rules in controlled zones may soon be things of the past.

Thus, while recognizing the desirability of a good clear view from the cockpit we consider several other factors to be at least as important: these are ground-radar control in the vicinity of the airfield, search radar in the aircraft, accurate position-fixing second by second, and possibly an extension of simple air rules of the quadrantal height separation type.

For the aircraft designer, the problem of providing a good view for pilots (and, for that matter, for passengers) may increase in difficulty for a year or two; then a change in conception may render it relatively simple again. Airframes designed for high pressurization and high speed do not easily lend themselves to holeyness. It is to the credit of several designers of current pressurized airliners that vision is at least as good as from their unblown-up predecessors—consider the Stratocruiser's crew glasshouse, and now the Viscount's deep screen and big ovals. Even the Comet, which operates considerably higher than these two, has fair-sized windows.

Possibly—probably, we might say—the future will see aircraft pressure and vision problems handled along submarine lines: a "conning tower" for manœuvring at surface level and a "periscope" and instruments for other occasions. The conning tower might take the form of an unpressurized nose or retractable blister for the pilot to use during approach, landing, taxying and take-off. On all other occasions the crew would control the aircraft from inside the main cabin-cylinder, using a second pilot's station, autopilot and all the usual instruments. On the ground, another crewman would be required to keep a look-out to sides and rear, perhaps from a retractable astro-dome—a practice widely encouraged in Service flying. Once established on the climb away, and with the aircraft under the ground direction until clear of congested regions, the take-off pilot would move into the inner cabin and close the air-sealed door to the nose or blister. Whether passengers in future generations of highly pressurized jet airliners will call for (or be given) any windows at all remains to be seen.



(Left) The scene at Runnymede at the moment of unveiling the memorial. (Below) After the ceremony had ended, the Queen (escorted by Admiral Sir Martin Dunbar-Nasmith) and the Duke of Edinburgh walked among the relatives, 25,000 of whom were invited to attend.

THE RUNNYMEDE MEMORIAL

The Queen Unveils the Memorial to Commonwealth Airmen and Women

THE weather for last Saturday's unveiling by the Queen of the Runnymede Memorial was grey and misty—the same kind of grey weather which, to many of those mourned for, must have meant a temporary respite from the stress of operational flying. And so, at Coopers Hill, where were gathered some 25,000 relatives and friends of the 20,500 airmen who gave their lives in the 1939-45 war and have no known grave (and whom the memorial honours) the greyness of the afternoon gave the proceedings a gentle touch of quietness, so appropriate to the occasion. Only after the sounding of the reveille did the sun shine, as a rainbow after a storm.

By 2 p.m. most of those attending the ceremony, including more than 2,000 from overseas, were seated in a huge semi-circle before the memorial, the doors of which were curtained and draped with flags of the Commonwealth air forces. In front of the edifice was drawn up the R.A.F. Guard of Honour, with the Central Band in attendance. Flanking the building, the branch standards of the Royal Air Forces Association provided a splash of colour. Some 25 yards in front of the door was the sky-blue and white royal dais.

Precisely at 2.20 p.m. the procession of officiating clergy moved up the main avenue to their appointed position near the dais. The choir of St. Georges, Windsor, was followed by the Rev. J. R. Appleyard (Principal Chaplain, United Board), the Rev. Canon A. S. Giles (Chaplain-in-Chief of the R.A.F.) and the Lord Archbishop of Canterbury with his chaplain. In the procession was carried the Gold Cross of Canterbury.

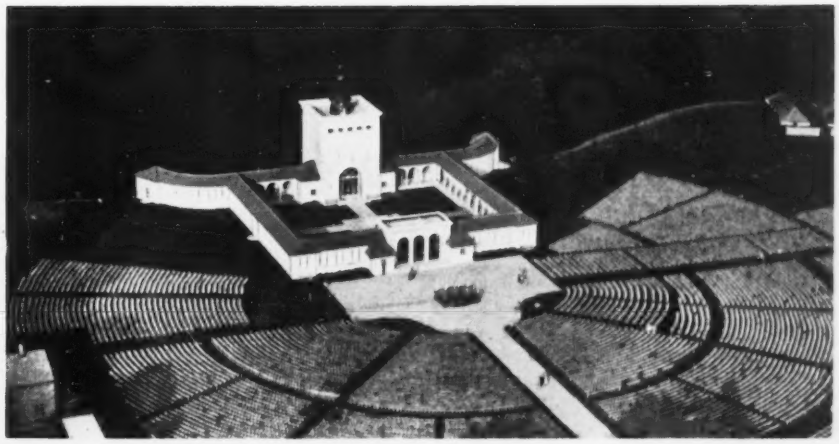
On her arrival at the main gate, accompanied by the Duke of Edinburgh in R.A.F. uniform, the Queen—with whom was Queen Elizabeth the Queen Mother—was received by the Duke of Gloucester, who is president of the Imperial War Graves Commission. Others present at the reception of the Queen were Gen. Sir Robert Haining, the Lord Lieutenant of Surrey; Mr. Anthony Head, chairman of the I.W.G.C.; Lord De L'Isle and Dudley, Secretary of State for Air; the High Commissioners for South Africa, Australia, New Zealand, Pakistan, Canada and India; Air Chief Marshal Sir William F. Dickson, Chief of the Air Staff; Admiral Sir Martin Dunbar-Nasmith, vice-chairman of the I.W.G.C.; Mr. J. E. Ferguson, the High Sheriff of Surrey; Mr. J. Simpson, Chief Constable; Clr. R. H. Try, chairman of the Egham Urban District Council; Mr. F. Higginson, secretary of the I.W.G.C.; and Mr. Edward Maufe, the architect of the memorial. As the party moved up the main avenue they passed between contingents from the Commonwealth air forces.

On arrival at the dais Her Majesty was received with a royal salute, after which she descended again in order to inspect the Guard of Honour. During the inspection she was escorted by Sir William Dickson, and the band played *Greensleeves*—the traditional slow march of the R.A.F.

Returning to the dais, the Queen was followed by the officiating clergy and the Service of Dedication began with the hymn *The Lord is my Shepherd, I'll not want* (the familiar words of the psalm are slightly changed when sung as a hymn). Selected from the third chapter of the book of the Wisdom of Solomon, in the Apocrypha, the Lesson included these appropriate lines: "*But the souls of the righteous are in the hand of God, and there shall no torment touch them. In the sight of the unwise they seemed to die: and their departure is taken for misery. And their going from us to be utter destruction: but they are in peace.*"

Then followed the Lord's Prayer and a special prayer for the Royal Air Force, after which the Duke of Gloucester invited the Queen to unveil the memorial. Before doing so Her Majesty addressed the gathering, in a voice crystal-clear yet full of sympathy; and at that moment many of us remembered that she, too, mourned a close relative—the Duke of Kent—who gave his life while serving with the R.A.F. during the war. The huge crowd, each little group of which had brought a floral tribute, sat silent in order not to miss a single word.

"It is very fitting," said Her Majesty, "that those who rest in nameless graves should be remembered in this place, for it was in these fields of Runnymede seven centuries ago that our forefathers first planted a seed of liberty, which helped to



(Above) The memorial with the seating ready for the ceremony. The Stone of Remembrance is in the centre of the cloister. (Left) The Queen is shown the reveals and ceilings by the architect, Mr. Edward Maufe, R.A.

spread across the earth the conviction that man should be free and not enslaved.

"And when the life of this belief was threatened by the iron hand of tyranny their successors came forward without hesitation to fight, and, if it was demanded of them, to die, for its salvation. As only free men can, they knew the value of that for which they fought, and that the price was worth paying.

"They were not alone in this knowledge and this sacrifice. At this very hour a memorial porch is being unveiled in Chelmsford Cathedral to commemorate some of those American airmen who fought together with us against the same aggression.

"With prophetic insight Pope wrote of this hill on which we now stand:—

On Coopers Hill eternal wreaths shall grow,
While lasts the mountain, or while the Thames shall flow."

Her Majesty then pressed a button, causing the curtains to be drawn from the face of the doors while trumpeters of the R.A.F. sounded the Last Post. As the poignant final note of the familiar call died away the voice of the Archbishop of Canterbury could be heard in dedication ". . . we dedicate this memorial, in memory of those of the Commonwealth Air Forces who went out from these shores not to return and whose bodies rest unknown in foreign lands or in the great deep. In the name of the Father . . ."

Then came the Reveille, and the R.A.F.A. standards which had been lowered in salute were raised again; and over the whole impressive scene there spread a gentle glow of autumnal sunshine, to remain while Isaac Watts' lovely hymn *O God, our help in ages past* was sung.

At the conclusion of the hymn came the Blessing and the General Salute, after which the Queen laid a wreath of orchids and pink carnations and roses. Wreaths were then placed by the Duke of Edinburgh, the Duke of Gloucester and those in attendance on the royal party; the R.A.F. wreath was laid by Air Chief Marshal Sir William F. Dickson. The singing of the National Anthem brought the Service of Dedication to a close.

Descending again from the dais, the Queen unlocked the entrance gates with a special key designed by the architect and made from wrought palladium-ruthenium alloy with the royal cipher inlaid in gold.

Having passed into the building, Her Majesty was shown the Stone of Remembrance, guarded by four airmen, in the centre of the cloister; the 20,455 names carved on the reveals by the slit windows; the badges, on the ceilings, of the Commonwealth Nations; and the great north window of the shrine, which overlooks the historic Runnymede meadows. So steeply does the ground fall away that the vista appears as if seen from an aircraft.

This window, designed by John Hutton, bears the words of the 139th psalm and on each side of the scroll on which the words appear are supporting angels. Above the angels' wings are engraved designs of vapour trails taken from photographs obtained during the Battle of Britain. Above all is the ceiling, also designed by John Hutton, showing a semi-circle of the sky with the two constellations which have always guided mariners and airmen—the Southern Cross with the South Polar Star, and the Plough or Great Bear with the North Polar Star. So exquisitely has the glass engraving been done that the words, with the angels, appear to float free in space above the Runnymede landscape.

At the completion of her tour of inspection through the memorial and before leaving the Queen and the Queen Mother spent over half-an-hour walking among the people, pausing here and there to speak to relatives.

When the Queen had left, a long queue formed to pass through the memorial and to lay their tributes on the greensward of the cloister. As darkness fell the memorial was floodlit and the pilgrimage continued until midnight.

J.Y.

A NOTE ON THE MEMORIAL

IN the achievement of victory in the 1939-45 war, more than 116,000 men and women of the British Commonwealth air forces gave their lives and of these the 20,455 who have no known grave are commemorated on the Runnymede Memorial. The total is made up as follows: R.A.F. 15,308, W.A.A.F. 10, Newfoundland 26, R.C.A.F. 3,072, R.A.A.F. 1,403, R.N.Z.A.F. 583, S.A.A.F. 16, R.I.A.F. 7, A.T.C. 4, Air Transport Auxiliary 10, B.O.A.C. 7 and Ferry Command 9.

After the war, the Air Council in conjunction with the Imperial War Graves Commission decided that in the United Kingdom there should be one memorial to these airmen and women, to include those serving from bases in Britain, Iceland, Faroe Islands, Northern Ireland, the Azores, France, Holland, Belgium, Germany, Denmark, Norway, Finland, Luxembourg, Czechoslavakia and Russia.

In 1949, the land on which the memorial has been built was given for that purpose by Sir Eugen and Lady Effie Millington-Drake. The entrance doors, of nickel silver, are the gift of the Mond Nickel Company.

In addition to those whose names appear on the Runnymede Memorial other airmen and women who have no known grave will be commemorated at Malta (for those who served in the Western Mediterranean and Southern Europe), El Alemein (North Africa and Middle East), Singapore (Far East), Ottawa (North America) and in certain cemeteries in Australia, Indonesia, New Guinea and the South-West Pacific. The Fleet Air Arm memorial is at Lee-on-Solent.

American Memorial Dedicated

THE American memorial to which the Queen referred in her address at Runnymede is in the South Porch of Chelmsford Cathedral and takes the form of new stained glass windows, an inner and a stone floor. Responsible for the scheme are the English-Speaking Union and the Essex Anglo-American Goodwill Association, which is now merged with the Union.

During last Saturday's service, Field Marshal Lord Montgomery and Major-General F. H. Griswold, commander of the Third United States Air Force in Britain, unveiled the stained-glass windows and the Bishop of Chelmsford dedicated the renovated porch.

At the close of the service a large contingent of the U.S.A.F., the R.A.F. and British nursing services marched to the Shire Hall, where the salute was taken by Col. Sir Francis Whitmore, Lord Lieutenant of Essex.

Lord Montgomery, speaking afterwards in the Shire Hall, said: "I do not think that there will be another war in the foreseeable future. There are only two dangers—complacency and political infirmity of purpose among the nations of the free world."

FROM ALL QUARTERS

Belgian-Built Hunters—

IN our issue of May 2nd, 1952, after a visit to the Avions Fairey factory in Belgium, we remarked that it seemed plain sense that the Meteors we had seen coming through the Gosselies shops should be quickly succeeded on the line by something newer and better fitted for the first-line defence of the west. Now, after a year and a half, comes the announcement that a large order for Hawker Hunters has been placed by the Belgian Government for construction by the Belgian aircraft industry. About two-thirds of the order concerns Avions Fairey, which organization will assemble major units (technically classified as category "D" components) supplied by the Dutch aircraft industry. Another Belgian firm, SABCA, will assemble about one-third of the total and will also manufacture wings and undercarriages.

A parallel announcement concerns a further substantial order for Hunters placed with Belgium under the off-shore supply scheme for the NATO programme. Of this order three-quarters will be built in Belgium from major components supplied direct by Hawker Aircraft, Ltd., and delivered by an air-lift system operating direct to the Avions Fairey airfield at Gosselies. A similar lift has been the practice with the Belgian-built Meteors.

The Rolls-Royce Avon turbojets for the Belgian and Dutch Hunters are to be built under licence in Belgium by Fabrique Nationale.

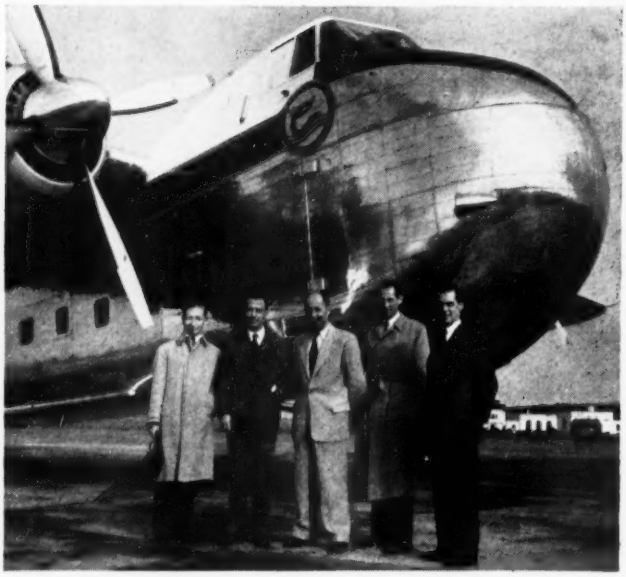
—and Dutch Re-equipment Plans

LT-GEN. I. A. ALER, the Netherlands Chief of Air Force Staff, made some interesting points in a recent interview. He began by saying that no one should be so complacent as to imagine that the Netherlands Air Force had as yet reached the target of full "adequacy" at which the country must aim. The Force, he declared, was still in the building-up stage. It is hoped to see it fully equipped with all modern radar devices by 1954-55, with Hunters by 1955, and with an all-weather fighter (the make of which Gen. Aler was "unable to indicate") by 1955-56.

At present the Netherlands Air Force is still using radar material taken over from the British forces immediately after the war, and while 100 million guilders' worth of such equipment has been on order with the Philips concern of Eindhoven since 1950, it appears unlikely that the whole contract—which includes the building of radar stations and command posts—will be completed before 1954-55.

Although "the real armament for the Dutch Air Force, the Hunter," is not expected in full delivery before 1955, it is "not unreasonable to hope," according to Gen. Aler, that the first few may come to hand by the end of next year. In the meantime, Holland will take the last fifth of an old-standing order of 300 Meteors which, at the time the order was placed, were badly needed for the training of pilots (the fighter force had twice as many trainees as passed-out pilots).

A proportion of the Hunters to be built in Holland will be at the disposal of the United States as "offshore" purchases, but the Dutch Air Force hopes to be given the use of the first to come off the assembly lines. (As we reported on September 4th, 460 Hunters are to be built under licence by Fokker, de Schelde and Aviolanda. Of these, 112 will be "offshore" to America. Of the remainder, 156 are earmarked for the Dutch Air Force and 192 for the Belgians. As related above, Belgium herself now comes into the "offshore Hunter" building programme.)



FIRST OF TWO Mk 31 Bristol Freighters ordered by Air Viet-Nam recently left Filton on its delivery flight in the hands of Capt. Ladure, the company's chief pilot, who has done over 4,000 hours on Bristol 170s. The second aircraft will follow shortly. Seen here are, left to right, Cmdt. Claudel (A.V-N. technical adviser), Capt. J. Jouanicou (co-pilot), Capt. Ladure, Mr. Verden (engineer) and Mr. J. Sullivan (Bristols).

The Decisive Battle

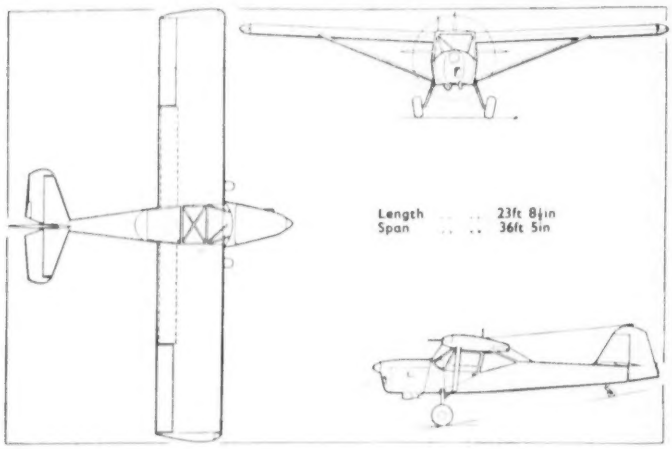
IN a speech at Hove, Sussex, last week, Lord Balfour of Inchrye said that because a war could be lost from the air within hours of its outbreak, absolute priority in money, material and men was needed for the Royal Air Force. To accept this fact needed a new outlook on defence, alien to many of high distinction who had been associated all their lives with the older Services.

"You cannot win the battle at sea," he said, "until you have won the battle in the air. You cannot win the battle on land without having first won the battle in the air. But if you lose the battle in the air at the very beginning you might as well have no sea or land forces.

"Today the cost of national defence bears heavily. The burden is as much as we can economically carry, and it cannot be increased in total. It is within the present total that we should re-orientate our views on the proportions to be spent on the air, the sea and the land. Until sufficient sums are spent and sufficient men attracted to the needs of the R.A.F. for our home defence—static, missile, fighter and bomber—we cannot consider ourselves as doing all we should for the protection of Britain."

Lord Balfour had said earlier in his speech: "Let there be no wishful thinking that the task of intercepting hostile bombers has been substantially solved by development of intercepting radio-directed rocket missiles, whether fired and controlled from ground or air. These scientific developments may increase the percentage of successful interceptions of enemy bombers, but some bombers will always get through. The damage the individual bomber could do with 1944 explosive power is like a scratch on the surface compared to the devastation that an accurately delivered atomic bomb would cause.

"Our ability to prevent continued atomic raiding of Britain's cities and bases depends upon having on instant call a highly efficient, adequately manned, strategic counter-bomber force of sufficient size."



THE NEW A.O.P.: Makers' drawings of the Auster A.O.P. Mk 9 (Blackburn-Cirrus Bombardier), now in production as a successor to the familiar A.O.P.6. The wing and flaps will be seen to have been completely redesigned and the wing is braced by a single strut on each side. The "fat" tyres and tailwheel should be welcomed by Army pilots, who are frequently called upon to operate from the most inhospitable terrains. Cantilever legs are used.

ACHIEVEMENT

Fastest and First to arrive
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England - New Zealand Air Race

THE VICKERS VISCOUNT

Brilliantly Flown By

BRITISH EUROPEAN AIRWAYS

was powered by

ROLLS-ROYCE
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The first propeller-turbines in the world to go into airline service.

THIS DISC BRAKE HAS

Fully Automatic Adjustment

...SAVES MAINTENANCE TIME AND COST

THE GOODYEAR single disc aircraft brake represents a new advance in safety and convenience.

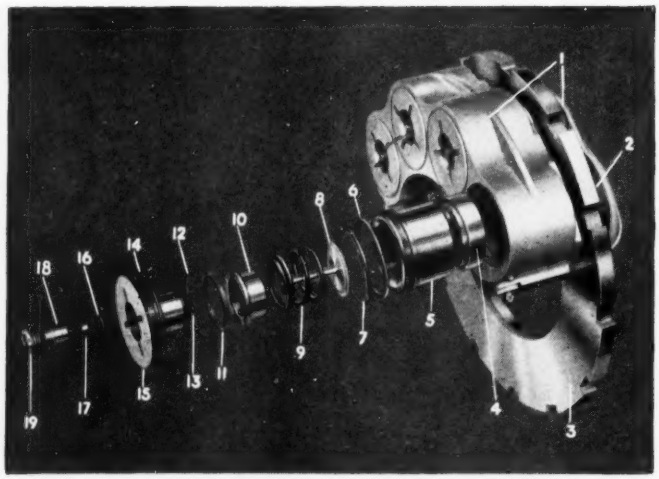
The brake is so designed that the predetermined clearance remains constant throughout the entire life of the linings. Adjustments are therefore unnecessary.

This means that periodic inspection and lining replacement is the only maintenance required.

Specially designed to ensure rapid heat dissipation, and simple in operation, the Goodyear disc brake has won wide acceptance from the aircraft industry.

The Goodyear Aviation Division will help you solve your landing gear problem, too. Technical representatives are always available to give advice, or to join in consultation with your own design staff. They will help you to see the job right through, from the drawing board to installation and servicing.

Clearance remains constant during the entire life of lining



Exploded view of the Goodyear Disc brake, showing arrangement of the automatic adjustment components.

1. *Brake Housing* **2.** *Inboard Lining* **3.** *Disc* **4.** *Outboard Lining* **5.** *Piston* **6.** *Leather Wiper Ring* **7.** *Piston Seal* **8.** *Self-Adjusting Pin* **9.** *Brake Release Spring* **10.** *Spring Seat* **11.** *Spring Retaining and Adjusting Ring* **12.** *Retaining Ring* **13.** *Adjusting Pin Seal* **14.** *Cylinder Head Seal* **15.** *Cylinder Head* **16.** *Washer* **17.** *Adjusting Pin Grip* **18.** *Spacer* **19.** *Adjusting Pin Nut*

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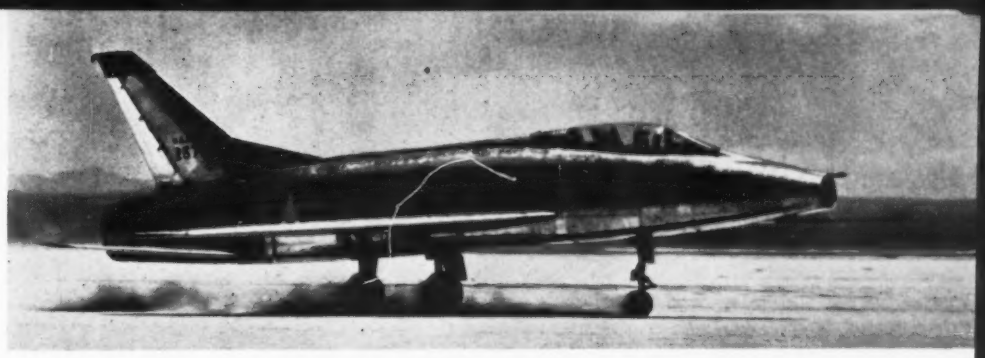
GOODYEAR

AIRCRAFT TYRES
WHEELS
BRAKES

GOODYEAR TYRE & RUBBER CO. (GT. BRITAIN) LTD., AVIATION DIVISION, WOLVERHAMPTON

FROM ALL QUARTERS . . .



SABRE SUCCESSOR: This, the hundredth fighter design adopted by the U.S.A.F., is the North American YF-100 prototype, seen at Edwards A.F.B., California, in the hands of George Welch; it is discussed in column 2 below.

The Woomera Atomic-weapon Test

BRITAIN'S second atomic-weapon was exploded at Woomera at 7 a.m. local time on October 15th, a year after the Monte Bello test, in which the first had been exploded in the hull of a frigate. For the second trial, the weapon (it is noteworthy that the non-committal official statements used this word, not "bomb") was mounted on a tower, and there were indications that it had a lower fissile content than the first. Speculation suggested that it may have been a charge of the kind which could be carried in a guided-missile warhead, or in a fairly small aircraft-bomb.

Although the explosion produced the usual awe-inspiring visual and aural results, correspondents who were later flown over the test-point said that the area of devastation was not so great as they had expected. The tower had disappeared and there was a half-mile circle of scorched and blasted earth, but five Mustangs, placed with other military equipment on roads leading to the site, were comparatively undamaged; a sixth aircraft had burned.

Only 15 minutes after the explosion a Canberra piloted by a medical officer, G/C. Wilson, flew into the area in order to collect air samples which would help to decide whether it was safe for investigating parties to move in. Meanwhile, two U.S.A.F. Superfortresses—"cloud-samplers" equipped with special collecting scoops—were tracking the movements of the cloud, which rose to between 15,000 and 20,000ft before being carried by upper winds towards an area of Australia even more desolate that the Woomera proving grounds. As we go to press, news of the explosion of another weapon is expected at any moment.

Keeping the News Hot

THROUGH the kindness of B.E.A. and Vickers-Armstrongs, a small number of copies of the October 9th issue of *Flight* was carried aboard the Viscount *Endeavour*, first transport aircraft to arrive at Christchurch in the London to New Zealand Race. Thus —for the first time, we believe—a periodical printed in England was in the hands of readers "down under" only 24 hours after its publication date. A letter of acknowledgment from one of the addressees, A.V-M. D. V. Carneigie, Chief of the Air Staff, R.N.Z.A.F., described this as "quite a thrill" for himself and his staff. We hope it will not be too long before higher airliner speeds and lower air-mail rates allow such despatch to become a weekly occurrence for our readers on the other side of the globe.

Skyray's 100-km Circuit

LAST week-end the Douglas Aircraft company claimed the world 100-km circuit record as a result of an officially observed flight by the F4D-1 Skyray second prototype (which, flown by Lt-Cdr. Verdin, recently claimed a new world speed record). On the 100-km circuit attempt the Skyray was flown by a Douglas test pilot, Bob Rahn, who was pictured with Verdin on p. 492 of our October 9th issue. Rahn flew a course laid out over the Mojave Desert, California, at about 300ft; the speed which is being submitted to the F.A.I. is 728.11 m.p.h. The present record stands at 709 m.p.h.; it was established on September 19th by S/L. Neville Duke in Hunter WB 188, in poor weather.

Hunter in Switzerland?

ACCORDING to a Reuter message from Berne last week-end, a Hawker Hunter 2 (Armstrong Siddeley Sapphire turbojet) is to be demonstrated to the Swiss Army. The report—which Hawker Siddeley Group spokesmen are so far unable to confirm—adds the statement that the Swiss Army is "interested in incorporating certain of the Hunter's engine features in Swiss fighters." It is believed that at least one design by the Federal Aircraft Factory at Emmen, Lucerne—possibly a tailless fighter designated N-2020—is to be Sapphire-powered.

Saab Sidelights

OUR description of the arrival of the Swedish Saab J-29s has brought a swift and appreciative response from the makers of the aircraft. The company now confirm that the armament is four 20 mm guns (not 15 mm, as it appeared) and describe the subsidiary air intakes as of a "special" type (not of the N.A.C.A. configuration). Incidentally, they point out that the wing roots are thinner than the tips, which feature improves the stalling characteristics with little sacrifice of Mach number.

Introducing the F-100

EVER since the prototype North American YF-100 flew on June 1st last the history of the type has been marked by such successes as rapid completion of U.S.A.F. Phase I testing at Edwards A.F.B.; the unprecedented achievement of supersonic flight *on the level* during the first day's testing; continual increase in orders for the F-100 at a time when nearly all other fighters were being "cut back"; and the attainment of a mean speed of over 757 m.p.h. during practice flying over a measured course.

The first picture of this most promising design has been keenly awaited; we reproduce it here. The F-100 series was originally known as the "Sabre 45" as a result of the increased angle of wing sweepback (although it is an entirely new, and much larger, aircraft); "Super Sabre" is the official name, and it appears to be merited.

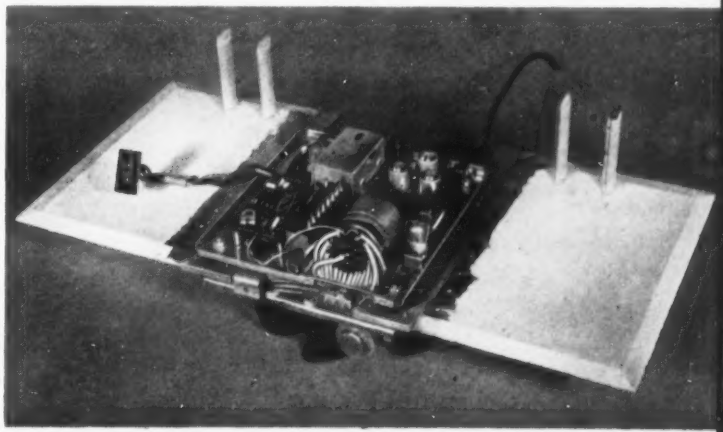
The engine is the Pratt and Whitney J57-P-7, a fighter variant of the big two-spool unit which has given such good results in the Goeing B-52. It is fitted with a huge Pratt and Whitney afterburner, which raises the maximum sea-level thrust to approximately 15,000 lb. The F-100 wing is not only swept at 45 deg but is extremely thin, so that all, or very nearly all, of the fuel is carried in the massive fuselage.

The fuselage is, in fact, big even for an American fighter, although it is shorter than that of the Hunter or Skyray. The nose intake is very wide, the duct bifurcating to pass outside the cockpit and tankage. The pitot head is carried in front of the intake, where it forms its shock-wave in undisturbed air. No armament details are available, although a *Los Angeles Times* drawing showed nose-mounted guns.

The F-100 control system is novel. In common with certain other supersonic designs (S.O. Trident, for example) the big, thin all-flying tailplane is mounted at the bottom of the slab-sided rear fuselage, where it is servo-actuated through an irreversible hydraulic control. Ailerons occupy the inner two-thirds of the wing which, in conjunction with other devices, make possible extreme manœuvrability. Basic design is for a general-purpose fighter/bomber and underwing attachments are provided for weapons, or slipper tanks of a new design. The undercarriage has very-high-pressure tyres, the main gear being of narrow track to fold into the fuselage.

The F-100A is in full production at North American's main plant at Inglewood, California; the first machine off the line is expected to be flying by the time this issue appears. An even more powerful engine than the J57 will be fitted when it becomes available. Leading data on the F-100A: span, 36ft; length, 45ft; height, 14ft; all-up weight, about 27,000 lb; maximum speed, about 800 m.p.h.

HIGH-SPEED ELECTRONICS: Complementary to the article on pages 556-8 of this issue, this photograph shows an installation of telemetering equipment in a small test-missile. The wings are seen to be approximately square in plan, and to have a trapezoidal section. The four vertical posts carry probes spaced about 2in apart above the leading edge.



HERE AND THERE

TARGET FOR TODAY: The Mutual Defense Aid Program is currently supplying NATO countries with radio-controlled targets. This one, a Radioplane KD2R-3 of the type used by the U.S. Army in this country, is about to be launched by Danish marines.

Far-flying Heavies

AS a trial of "global mobility," and to test the efficiency of bases abroad in handling heavy formations, a U.S.A.F. squadron of B-36s—probably ten aircraft—is to fly to Thule, Greenland, next month, while another will go to one of the American airfields in North Africa.

Bell X-5 Destroyed

ONE of the two Bell variable-sweepback experimental aircraft crashed last week near Edwards A.F.B., California. The pilot, Maj. Raymond Popson, lost his life.

Indian Gliding

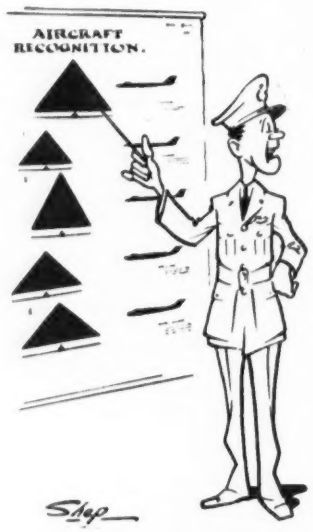
THE Central Advisory Committee for the Indian National Cadet Corps has recommended the introduction of glider training as part of the curriculum of the Senior Division (Air Wing) of the N.C.C.

Joint Celebration

AS part of the Wright Brothers 50th anniversary celebrations, the Royal Aeronautical Society is to join forces with the Royal Aero Club in holding a dinner at the Dorchester Hotel, London, on December 17th. Afterwards a film will be shown, *The Story of the Century*; made by the Shell Film Unit, it records the growth of powered flying and its impact on civilization.

D.H. Plant Expansion

ON Friday last Lord Salisbury formally opened a factory which the de Havilland Aircraft Co., have built at Stevenage in order to increase their machining capacity in that area. Already in operation with 160 employees, the factory is designed with a view to extension, and it is likely that before very long the floor-area will be doubled and the number of workers trebled. The main factories of the enterprise, at Hatfield, Chester, Portsmouth, Christchurch (Hants), Edgware, Watford and Bolton have taken £80 million worth of export orders since the war ended.



"There is a distinct difference here. The words 'jacking point' are stencilled noticeably further forward."

U.S./European Industry

IN ORDER to facilitate the production of standardized spare parts for the American-built aircraft of all NATO countries, several American firms are establishing European subsidiaries. The first two—Republic Aviation International (Zurich) and Curtiss-Wright Europa N.V. (Amsterdam)—have now been joined by a company formed to look after the interests of the Fairchild C-119 Packet transports supplied to Belgium, Holland and other countries under M.D.A.P. The new establishment of the Fairchild Aircraft and Engine Corporation will operate from Amsterdam; Fairchild also have some agreements with Fokkers. With regard to "offshore" purchases, it can now be stated that Italy is producing aircraft, JATO units, spares and accessories to the tune of $42m. By far the biggest recipient of "offshore" work is Fiat ($32m) who are assembling all-weather F-86Ks and making J35 turbojet spares. American sources state that, when Fiat begin to make F-86Ks from scratch, Rolls-Royce are anxious that the Avon RA.7R should be chosen in place of the J47 now specified. (Other "offshore" news, p. 552.)

WHITE HOUSE VISIT: As we recorded last week, the climax of the Hawker Siddeley Group executives' visit to America was a meeting with President Eisenhower. Here, photographed on leaving, are Sir Frank Spriggs, Mr. Harold Talbott (U.S. Secretary for Air) and Sir Roy Dobson.

Precisely

THE F.A.I. has confirmed a Soviet claim to a precision parachute jump by a group of three men from an aircraft at 600 m (1,968ft); their average landing-distance from the spot-mark was 40ft.

Navigational Interest

ORDINARY membership of the Institute of Navigation, as analysed in the recently issued annual report, stood at 1,233 on June 30th last, an increase of 94 over the corresponding figure last year.

Fang-fare

"MARY LOU MOSBY . . . receives a check for $15 . . . she won her prize for this suggestion: provide mint-flavoured toothpicks with all Flagship meals"—caption to picture in *Flagship News*, American Airlines' journal.

Aviation Art

AN exhibition of works by Roy Nockolds, well known painter of aviation and motor racing subjects, is to be held from October 27th to November 7th at Kensington Art Gallery, 15 St. Mary Abbott's Terrace, London, W.14. Some of his war paintings will be included.

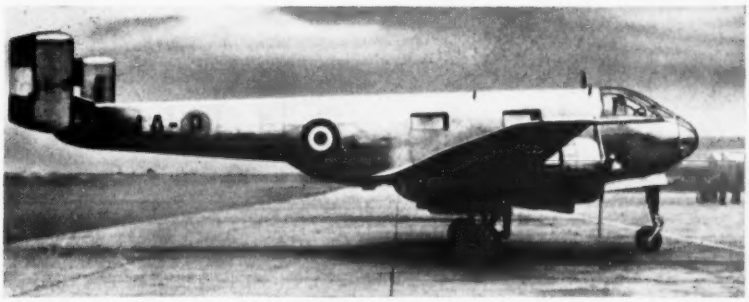
Haste to the Meeting

DELEGATES attending the annual meeting of the Australian Women Pilots' Association at Adelaide on October 31st-November 31st are to make their journeys from various parts of the country as competitors in an air race; handicaps will be based on the distances flown.

For Clearer Skies

AN exhibition devoted to the causes and cures of smoke and "smog" is to be held for four weeks from November 9th in the Museum of Hygiene (Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1). Exhibits will demonstrate how needless smoke is produced; its harmful effects in certain meteorological conditions; and ways and means of reducing atmospheric pollution.

AIRCRAFT INTELLIGENCE



ARGENTINE ANNIE: Now under test at Cordoba is this prototype I.A.E.35, which is intended for use in ambulance, photographic and survey or general-purpose roles. Powered by two 650 h.p. El Indio radials, it enjoys some 400 h.p. more than the Beech 18s which it may replace.

Great Britain

Avro Tudor. The "mystery" buyers of the four Mk IVs and six Mk Is sold recently by the M.C.A. are now known to be Air Charter, Ltd. Overhaul work is under way at Southend and Stansted. One Mk II—G-AGRY, operated by a subsidiary, Fairflight, Ltd.—was recently observed wearing a large Union Jack on the fin, small R.A.F. roundels and the serial XF 537.

Percival P.87. To our knowledge, 12 British and foreign journals have so far stated that the P.87 short-haul transport is to be powered with two Napier Eland turboprops. Such is not the case; no airliner of this class needs 6,000 h.p. The engines which Percivals have in mind *are* Napier turboprops, but they are of an entirely new design, as we said in our issue of September 11th. One of the noteworthy features of the engine is the ease with which it can be installed in the wing, particularly if a pusher propeller is used. Napiers have, of course, many promising projects under development, another being the low-pressure gas system specified for the rotor of the Percival P.74.

France

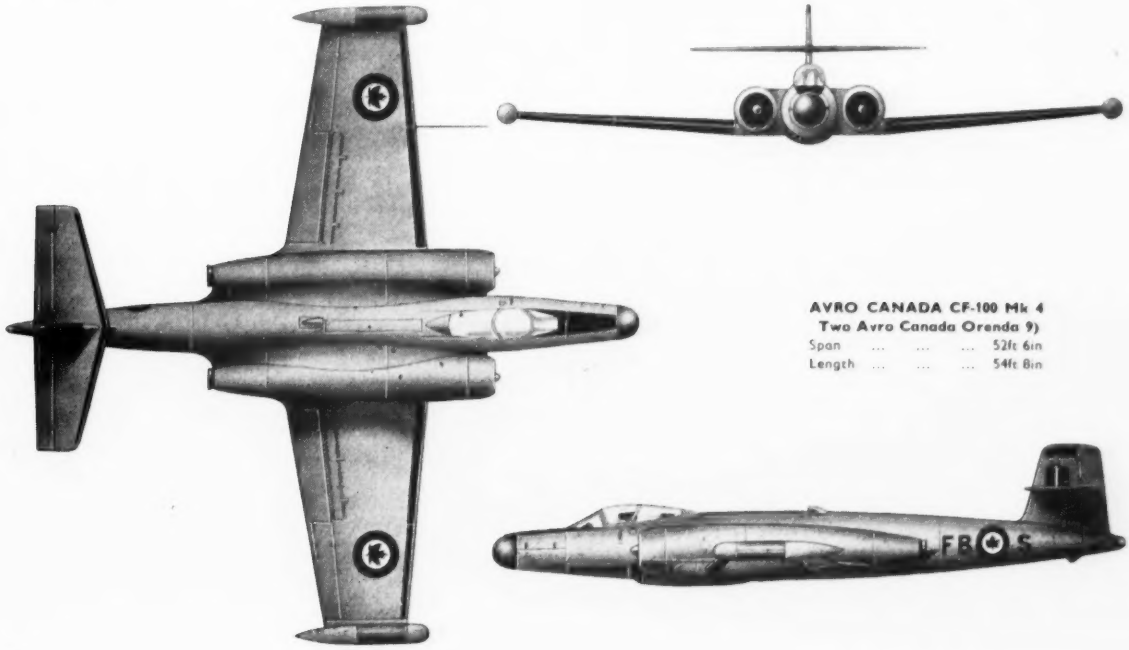
Hurel Dubois Work. The H.D.31 twin-engined high-aspect-ratio aircraft is now in its makers' works after successful testing, in order that a number of modifications may be incorporated. Soon to fly is the H.D.32, with more powerful engines (Twin Wasps) than the single-row, seven-cylinder Wright radials of the H.D.31. The 32 will be a commercial version fitted for passengers; we understand that the Aéronavale (but not the Armée de l'Air) are keenly interested in this machine. Late next summer Hurel Dubois hope to fly the H.D.33, which will be a freighter. It will have a large loading door under the rear fuselage (a good feature in a paratroop transport, also) through which vehicles can be loaded on to the low, level floor. Meanwhile, work on the high-speed H.D.45 transport, to be powered by two Hispano Suiza Avon turbojets (originally quoted as Rolls-Royce-built RA.16s) is being hastened. A full-scale wooden mock-up has been completed, and it has served to "fix" several alternative interior layouts.

United States

Grumman Fighters. The Grumman XF10F Jaguar, to which we referred on this page of the October 9th issue, will not be built in quantity; what will be done with the big factory at Peconic River is uncertain. The first machine is now at the Naval Air Materiel Center, where it will be used as a test bed. Following the Jaguar is a new fighter, probably to be the XF11F, which faintly resembles the Hunter. The Wright J65 Sapphire is housed in a needle-like fuselage, and the design is clearly for a very fast, medium-weight fighter. *Aviation Week* states that a switch to the General Electric J73 is possible.

Republic F-103. Although the delta-wing Mach-2 Convair F-102 has not yet flown (it should fly this month), Republic already are well advanced on the prototype of a successor to it as the standard U.S.A.F. all-weather, automatic intercepter. This is the F-103 and, although it will be a 40,000 lb aircraft like the F-102, it is designed for Mach 3. Cruising power is supplied by a Wright J67—a development of the Olympus—but, for full speed, the airflow can be diverted by means of shutters to a large ramjet. The F-103 is stated by *Aviation Week* to have a long fuselage with a needle nose, the thin delta wing being well aft.

Ryan Model 72. One of the competitors of the Temco Plebe (this page last week) for a U.S. Navy trainer contract is the Ryan 72, developed from the Navion. Releasing this information, Ryan state, "For the first time in a military trainer, instructor and student are seated side-by-side, a revolutionary change. . . ." It is gratifying to see R.A.F. policy adopted in the U.S.A. in this manner; all our Flying Training Schools have long been equipped almost entirely with side-by-side aircraft such as the Prentice, Provost, Balliol and Vampire—this being the result of 15 years of deliberation. We also have no doubt that, when trainer versions of the Hunter and Swift appear, they will be of similar layout.



AVRO CANADA CF-100 Mk 4
Two Avro Canada Orenda 9)

Span	52ft 6in
Length	54ft 8in

C

GUIDED-WEAPONS TELEMETERING

The Two Principal Systems Developed by the Ministry of Supply

ALTHOUGH most of the details of our vast guided-weapons programme (sponsored by the Ministry of Supply, and carried into effect by the Ministry's research establishments and some hundreds of aircraft and electronic firms) remain a well-kept secret, a little may now be said of the systems employed to transmit information from a missile in flight. Visitors to the M.o.S. stand at the recent S.B.A.C. show will remember the slight drawing-aside of the veil that has hitherto covered this subject.

Clearly, an efficient telemetering system is a pre-requisite to the development of any form of pilotless aircraft or missile. Much can, it is true, be learned from tests in high-speed tunnels in which readings can be taken directly. Eventually, there comes a time when data still required can be obtained only by actually building and launching a test-vehicle equipped with sensing elements whose readings can be transmitted to the ground by means of a telemetering system. If the system fails, not only is the expensive missile an almost complete waste of money and effort, but the whole development programme of the eventual weapon may be retarded by weeks or months.

The system must, therefore, set a high standard of efficiency and reliability and, into the bargain, should have good frequency stability in the face of considerable thermal and mechanical shock or power run-down; high power-output; small bulk and light weight; and—since the equipment is of a short-life, expendable nature—economy in cost.

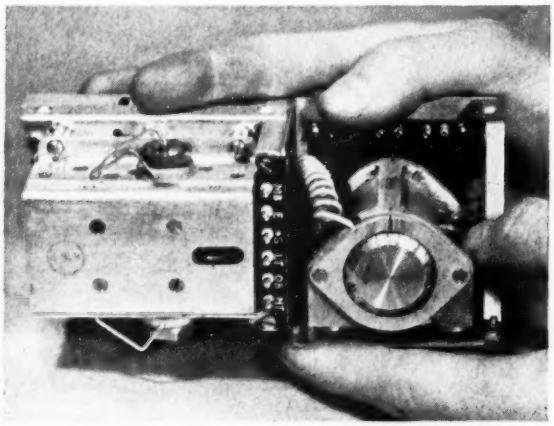
The telemetry equipment used falls broadly into two classes. For some purposes—the measurement of simple mechanical quantities such as control-surface position, strains, pressures and torques—the "time multiplex" or "sharing" system is adequate. This provides a large number of separate radio channels, each having a low frequency-response, and being used for the exclusive transmission of one particular quantity. Where it is necessary to measure the wave-forms and general behaviour of electronic equipment carried in the missile the above system is quite inadequate. An additional transmitter is required working at a high frequency on either the "pulse position modulation" (P.P.M.) or the "time division" system.

Two systems capable of meeting all immediate requirements, have been developed by M.o.S. research teams. Each system consists of a standard ground receiver which picks up the output from any of a variety of types of airborne transmitter. Both types of equipment, descriptions of which follow, are in quantity production by firms in the British electronic industry.

Time Multiplex System.—The great advantage of this method is that it provides a calibration channel, with which the accuracy of the equipment can be checked throughout its life. The basis of the airborne transmitting section is a rotary sampling switch, the contacts of which are connected to pick-ups which convert the physical data into electrical variations. The switch samples each pick-up in turn and allows it to send its particular message to the ground only for a small percentage of the total time. This, coupled with the mechanized switch speed, accounts for the low frequency-response of the system.

The output from the pick-ups passes, *via* the switch, to a modulator. This generates a sub-carrier whose frequency is directly related to the voltage or inductance fed into it by the switch wiper. The resultant time-multiplexed frequency modulation is used to amplitude-modulate an R.F. oscillator. At the ground station, the final records obtained are in two forms: a main low-speed record on which any channel or desired combination of channels is separately displayed, and a high-speed or histogram record from which all the possible information transmitted by the sender can be ascertained by analysis.

Since the set must be fitted to projectiles of varying sizes, from three inches diameter upwards, flexibility is an important factor in its design. The components of the sending set have, therefore, been designed as standard units which can be arranged on various sizes of chassis. The dimensions of the smallest chassis yet fired were 5¼in x 3½in x 2½in (telemetry chassis) plus a power-supply chassis measuring 4½in x 3in x 2¼in.



A typical time-multiplex transmitter can almost be held in one hand.

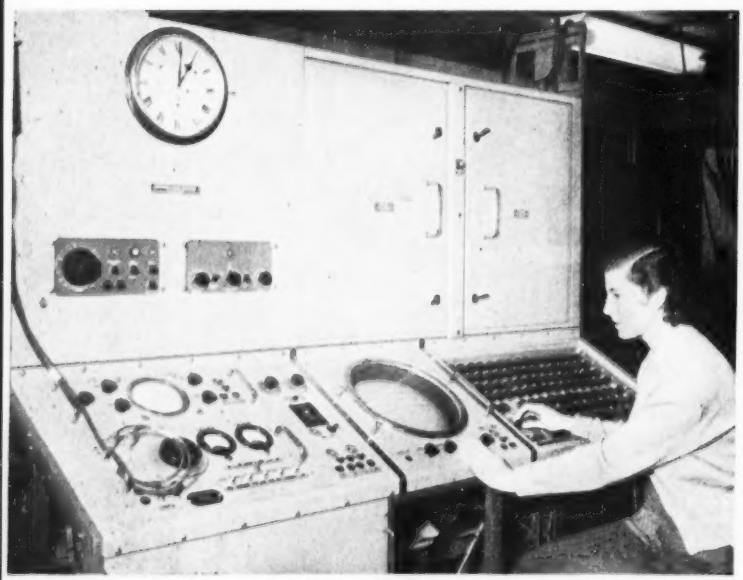
Both the voltage and inductance types of pick-up used in the system are produced in a variety of types and ranges. Inductance pick-ups available include linear and angular accelerometers, pressure pick-ups and linear- and angular-movement pick-ups. Voltage pick-ups usually take the form of a resistance potentiometer. A number of such designs in the form of pressure pick-ups, general movement pick-ups from control surfaces, or temperature pick-ups have been developed.

On the speed of the switch unit depends the channel frequency response of the system. Three models of the switch are in use, with speeds of 120, 80 and 40 c.p.s. respectively.

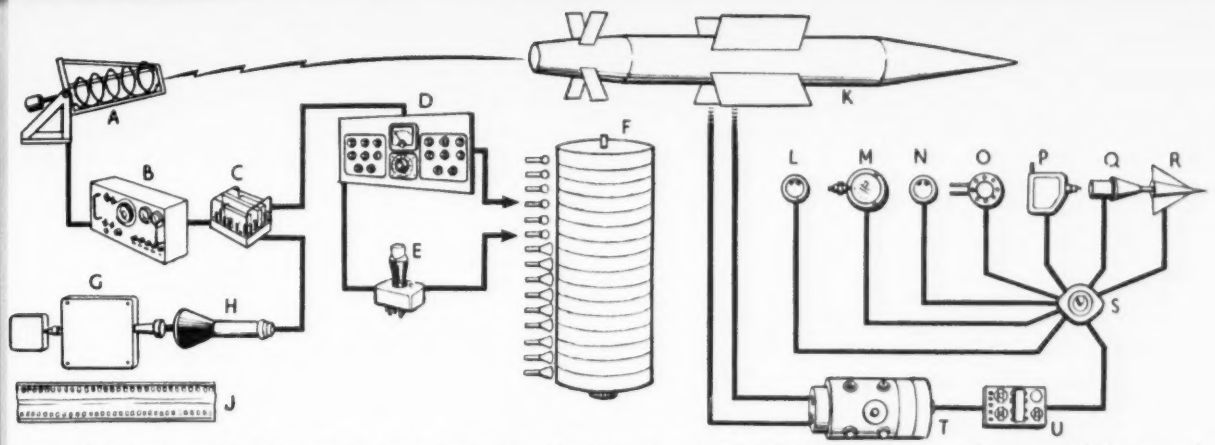
The switch itself consists of a miniature motor, working from 6.3 v D.C., driving a four-finger, nickel-silver brush assembly in a two-way commutator, moulded in Araldite. "Break-before-make" contacts (to avoid momentary coupling between channels) are made from the centre of the brush assembly. A small felt pad, serving the dual purpose of lubrication—with a specially-developed oil—and the collection of brass dust, is mounted diametrically opposite the brush fingers.

To make wiring easier and to facilitate rapid switch-changing, a 24-way socket, moulded in nylon-reinforced Bakelite and using b7G valve-base type clips as contacts, is included in the switch unit. The socket is pushed into position and clamped to the commutator by two screws.

Three types of modulator are in use with the system, one accepting inductance inputs only, one voltage inputs only, and one responding to both types of input. Built on both sides of a Bakelite board, all are compact and easy to service.



Standard ground equipment at which missile data is received.



This drawing, which is based on the display panel exhibited by the M.o.S. at the S.B.A.C. Display, represents a typical time-multiplex system in simplified form. The components are ennumerated in the key below. Missile K houses units L to U inclusive.

A, helical aerial; B, main receiver; C, demodulator (delay approx. 3 micro-sec); D, signal amplifier and sync-separator time base; E, strobe unit; F, drum of 24in-wide film recording traces of 15 c.r. tubes (from the top: tele. bay; D.C. voltages; pitot static, starboard; pitot static, port; primary fuel, port; air blast; combustion chamber; wall static, port; main fuel, port; main fuel at block; primary fuel, starboard; D.C. voltage and 1g switch; acceleration; main fuel, starboard; and wall static, starboard); G, high-speed camera; H, c.r. tube; J, section of high-speed record; K, missile; L, accelerometer (variable inductance for longitudinal and transverse acceleration); M, voltage-type pressure transducer (for fuel pressure, etc., range 0-4,000 lb/sq in); N, standard calibration inductance; O, variable-inductance pressure transducer (range 0-200 lb/sq in); P, voltage-type pressure transducer (for fuel and hydraulic pressure, range 0-600 lb/sq in); Q, R, angle-of-attack head and socket (variable inductance measuring pitch and yaw); S, high-speed rotary sampling switch; T, transmitter; and U, modulator.

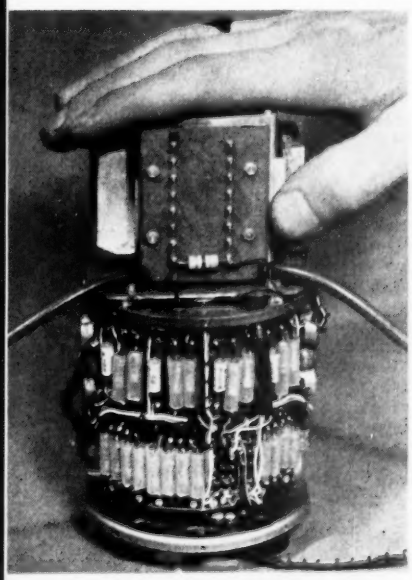
In the case of the inductance-responsive modulator, a normal triode oscillator is used, the pick-up providing the variable inductance of the tuning circuit. The output of the oscillator is then amplified to give the power needed to modulate the r.f. oscillator. In the second modulator, responding to voltage inputs only, the frequency of oscillation of a tuned-grid triode is controlled by a conventional reactance valve which forms part of its tuned circuit, the output frequency being again amplified to modulate the r.f. oscillator.

To provide a combined circuit responding to both voltage and inductance inputs, these two circuits are combined in a four-valve version. The first valve acts as an oscillator for inductance inputs, and the second as an amplifier which locks the third valve frequency to that of the first. The fourth valve is a straight amplifier. In the case of voltage inputs, the first valve is rendered passive by the damping of its tuned circuit and the voltage applied to the input to the second valve which, acting as a reactance valve, determines the frequency of oscillation of the third valve. The fourth valve is, again, a straight amplifier. In all cases the range of frequencies generated is 130-160 kc which, in the case of voltage inputs, is covered by a change of 6 volts.

To provide adequate power for all ranges, while keeping the D.C. demand as small as possible, three oscillators were designed for use in the system, with outputs (measured on a C.W. basis) of 0.2, 1 and 8 watts respectively. The earliest version was the 0.2 watt oscillator, built in the form of a push-pull tuned plate, tuned grid oscillator, using a CV858 (6J6). This is now obsolescent and is being replaced by the 1 watt version, which has a similar circuit arrangement but is built around a specially-developed sub-miniature valve.

The larger 8 watt unit, used for longer ranges, consists of a tuned - anode, tuned-grid oscillator built around the CV 397a disc-sealed triode. As the modulator cannot control this oscillator unaided, a driver-unit, supplying the necessary power, is included in this model. Both the 1 watt and 8 watt oscillators can be arranged to work either C.W. or pulsed, the choice depending largely on the avoidance of interference with other r.f. circuits associated with the oscillators in missiles.

The fact that these oscillators must be easily controlled in frequency and permit coupling to whatever aerial system is available and, at the same time, be stable over a wide range of temperatures and pressures, involved major problems of design. This was particularly the case with the high-power oscillator, where high voltages combined with low pressures necessitated considerable development work to prevent flash-over. As a by-product of this work, the design of r.f. power-measuring and impedance-measuring equipment at these frequencies had to be developed from scratch, as no suitable units existed for testing purposes.



A typical P.P.M. transmitter for installation in a test rocket.

The ground equipment of the system provides two records, a histogram (i.e. high-speed record) and the main record. For the latter, the signal received from the airborne sender is changed, after demodulation, to a series of direct-current levels, and the step function thus produced is applied simultaneously to the Y-plates of 15 cathode ray tubes.

From the output of the r.f. receiver a filter separates out the synchronising signal, which is then used to generate the time base for a large monitor tube and also to produce strobes coinciding with each channel. These pulses are used to brighten the traces on the 15 cathode ray tubes. Any number of them can be connected to each of the display tubes so that any channel or any combination of channels can be displayed on any of the tubes. All 15 tube-faces are photographed side-by-side on a moving film 24in wide, as shown in the diagram above.

Timing pips at each tenth-of-a-second are recorded on each tube, as also is the firing pulse. On the completion of each firing, short calibration lines from a crystal-controlled frequency generator are added to the record.

The histogram recorder is designed as a self-contained unit for producing records from single-channel senders or histogram traces from multi-channel senders. It contains a receiver and discriminator similar to those used in the main equipment, and is fed from a separate helical aerial. The display consists of three cathode ray tubes, one large and two small, which are photographed simultaneously by a 35 mm ciné-camera.

The large tube displays the single-channel record, or the series of 24 direct-current levels corresponding to the channels in the sender. One of the small tubes is used to display a time scale, the lateral position of which is calibrated in terms of field strength, and the other small tube indicates any radio-frequency deviation throughout flight.

The P.P.M. System.—In this method, channel information is given by the time interval between the trailing edge of a reference pulse (about 50 micro-seconds long) and the incidence of a one-micro-second channel pulse. The carrier frequency is pulse modulated by the reference pulse and the channel pulses, the recurrence frequency of the complete pulse train being between 2,000 and 5,000 per second, according to the number of channels in the sender.

Up to 20 channel-pulses, each of which can vary over a range of 400 micro-seconds, can be accommodated between successive reference pulses. Normally, however, each group of pulses is confined to consecutive intervals of 80 micro-seconds, the range of time displayed on each of the five cathode ray tubes in the ground equipment. Each channel is arranged to produce, either directly or *via* a transducer, a variation of voltage or capacity which is used to control the time interval between the trailing edge of a reference square-wave and the generation of the respective channel pulse.

The airborne transmitting equipment of the set, the main parts of which are a modulator and an oscillator, is made in the form of a cylinder, with a diameter of 4½in and an overall length of 6¼in for a 12-channel set. For ease of manufacture and

GUIDED-WEAPON TELEMETERING . . .

servicing, the modulator is split into sub-units, built around sub-miniature valves, consisting of a square-wave generator and a number of four-channel blocks. Sub-units, each of which is "potted" in Marco-resin, can be assembled to form modulators for 4, 8, 12, 16 or 20 channels.

The wave form generated by the modulator consists of a wide pulse of approximately 40 micro-seconds width, the trailing edge of which is the time reference for the system, followed by a number of narrow pulses of 1 micro-second width. The wide-pulse generator consists of a screen-coupled phantastron. From the screen grid of this valve the pulse, negative in direction, is generated and fed to the grid of a feedback amplifier which inverts it and applies it to the grid of a cathode-follower driver. The load of the cathode follower is taken to the bias line so that, in the absence of the positive pulse, the oscillator grid is cut off.

To derive the trigger for the narrow-pulse generators the screen grid waveform of the phantastron is also differentiated and applied to the grid of a cathode follower, which cuts off the negative pips so that, at the cathode, a positive trigger pulse appears which corresponds to the trailing edge of the wide pulse. This trigger pulse is the A.C. (D.C. in later versions) coupled to the suppressors of a number of phantastrons through individual diodes, which act as D.C. restorers to the negative line through suppressor resistors.

In the absence of trigger, the suppressors are held negative, so that no anode current flows. The screen grids are at a low potential owing to the fact that the screens are taking the cathode current. When the trigger occurs, the anodes begin conducting, starting their negative voltage excursion due to the Miller action of the circuit. This negative excursion is fed to the grids by the anode-grid feed-back capacitors tending to cut off the valve current. When this occurs, the screen potentials begin to rise. As a result of the capacity coupling between screen and suppressor, this rise is fed to the suppressors and tends to drive them more positive and hold them there. This feedback makes the screen waveform edge very sharp.

The valves remain in this condition until the Miller action ceases, i.e. until the valves "bottom." This occurs at different times, owing to the different components and inputs which control the rate of anode run-down. When a valve "bottoms" its anode can draw no more current but, as the grid tends to go positive, the screen commences drawing current so that its potential falls. When this happens a sudden change-over of current occurs between anode and screen, due to the suppressor screen coupling. The anode remains in this condition because the suppressor is cut off by the screen wave-form. The circuit then remains in this condition until the next trigger pulse arrives to repeat the cycle.

The screen wave-forms are then differentiated so that a series of negative pulses is produced which correspond to the various "bottoming" positions of the valves. These pulses are normally arranged in sets of four, each pulse having an excursion of 80 micro-seconds for full-scale deflection, the groups being constrained to occupy the time scales of 80-160, 160-240, 240-320, 320-400 and 400-480 micro-seconds (the time intervals required for full-scale deflection of the five display tubes of the ground equipment).

The pulses are then applied to the grid of the feedback amplifier together with the wide pulse, so that the output at the anode is the wide pulse followed by the narrow pulses. This waveform is used to modulate the oscillator. The oscillator normally used is a 2 watt (rated on C.W.) model but for longer ranges an 8-watt oscillator similar to that used in the time-multiplex system has been produced. With varying D.C. supplies, this meets all requirements from 2 to 8 watts.

A greater number of information channels can be obtained by introducing a time-division switch on one or more channels with the corresponding sacrifice of frequency response. Standard switch wafers at present in use have eleven contacts which can be arranged in a number of different ways—four capacity and four voltage channels, or eleven voltage channels with the same voltage excursion, being typical assemblies.

As these channels may be arranged to overlap and up to four may be interlaced, some method of identification is needed. This is provided by an identification switch which runs at a low speed connecting each input to a fixed voltage, usually earth, in sequence so that, once one channel has been identified, all the rest follow in order.

The ground equipment of the P.P.M. system produces a maximum of five displays depending on the number of channels in use. The time scales mentioned above (80-160, 160-240, 240-320, etc.) are used as the Y time bases for five separate cathode ray tubes, the channel pulses being used as brightening pulses for these traces. Each tube is continuously photographed by a 35 mm camera, the film-speed of which can be varied from 2 to 120 in/sec.

To achieve this the signal is received on the ground and, after demodulation by a sensitive receiver, the resultant train of pulses is fed into a voltage circuit box unit. Here the pulses are limited and the square reference wave is separated from the channel pulses. A trigger pulse is then generated from the trailing edge of this square wave, and goes to each of the five time-base generators, where two phantastron delay circuits are used to develop the appropriate Y-axis time base for each display tube. At the same time, the channel pulses, after further amplification and limiting in the voltage circuit box, pass through a pulse-forming channel, and are used as brightening strobes for the cathode ray tubes. Initially, the time base is adjusted to scan the whole face of the cathode ray tube and, to check that no variation of the 80 micro-seconds needed to do this occurs during flight, brightening strobes from the time-base circuit are used to mark the two ends of each scan.

Before each firing the time bases are set up accurately and checked by means of a built-in crystal calibrator, which is fed into the voltage circuit box, and the scan on each tube adjusted accordingly. A timing trace, obtained from the range master-timing system, is displayed on a small cathode-ray tube by the side of each of the channel recording tubes so that it is photographed simultaneously on the 35 mm film. On firing, a pulse from the firing switch is arranged to displace this trace and indicate the instant of firing.

I.P.E. PRODUCTION CONFERENCE

IN December last year the Institution of Production Engineers held a conference on *Problems of Aircraft Production* which was (as we said at the time) "very well attended and which admirably served its purpose—the spreading of ideas for facilitating production."

This year the event is to be repeated; the University of Southampton will again be the venue, and the dates will be Friday and Saturday, December 18th and 19th. The meeting will begin with a luncheon, on the Friday, at which Mr. Lennox-Boyd, Minister of Transport and Civil Aviation, will be principal speaker. Thereafter the programme is as follows: —

Friday.—At 2.45 p.m., *The Trend of Design*, by D. Keith-Lucas, B.A., M.I.Mech.E., F.R.Ae.S.; at 5 p.m., *Production Problems Arising from the Trend of Design* (two papers), by G. H. Dowty, F.R.Ae.S., and S. P. Woodley, M.B.E.

Saturday.—At 9.15 a.m., *User Problems Affecting the Industry* (two papers), by B. S. Shenstone, M.A.Sc., F.R.Ae.S., A.F.I.Ae.S., and Air Marshal R. O. Jones, C.B., A.F.C. From 11.45 a.m. to 12.45 p.m., a summing-up by Sir Frederick Handley Page, O.B.E., Hon. F.R.Ae.S., F.C.G.I.

All the papers will be of comparatively short duration, so that the remaining periods in each of the sessions may be devoted to discussion.

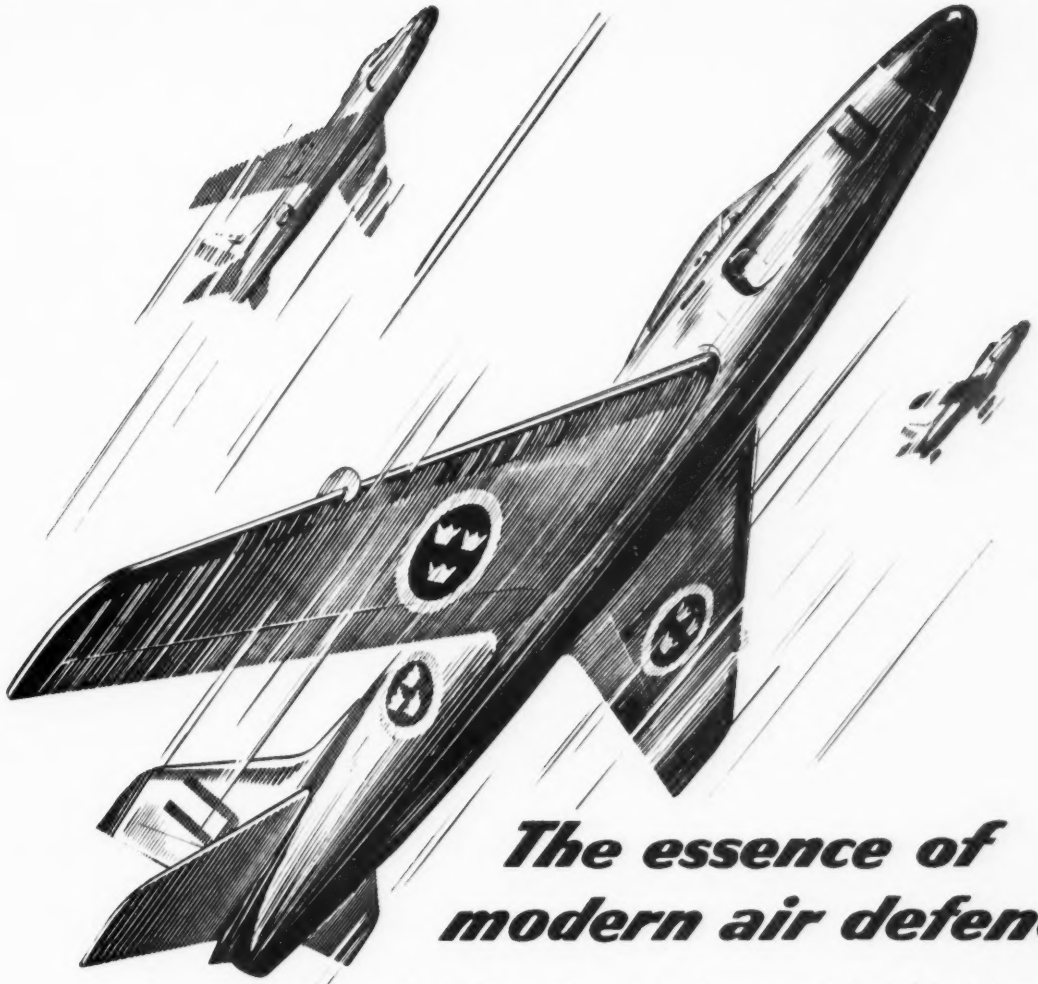
Admission to the conference is by invitation, following application—which should be made as early as possible—to the Secretary, the Institution of Production Engineers, 36 Portman Square, London, W.1.

BIRD-WATCHING FROM AIRCRAFT

"MANY ornithologists are anxious to obtain information regarding the heights reached by birds whilst migrating and also in the course of their daily activities," writes Capt. K. D. G. Mitchell, of B.E.A., introducing a paper on *Aerial Observations on Birds Flying Above 500ft* in the 1952-3 illustrated *Bird Report* of the Merseyside Naturalists' Association (Buncle, Arbroath, 3s). Compared with the opportunities of seeing birds from the ground, the chances of seeing and recognizing birds in flight during several thousand flying hours in the past ten years were disappointingly few. However, other aviators have also contributed observations, and the Association hopes to publish more in the future.

Some of the more interesting observations include cormorants at 1,800ft over the Isle of Man, a swift at 2,500ft over Portland Bill, and grey geese at 5,500-6,000ft and above cloud over the Derbyshire Peak on a day when the whole of Britain was covered with stratus. There are several observations on starlings flying at 500ft, 900ft and 2,200ft (after climbing through cloud) and upon lapwings at 3,000ft over Wolverhampton, 6,000ft over Rugby, and crossing the Irish Sea.

Such factors as height of cloud, direction of wind and other meteorological conditions liable to influence the height of flying birds are included in the observations, which are intended to be followed with further papers on this subject. Anyone with such records and observations is asked to send them to the hon. secretary of the Association at 47 Woodsorrel Road, Liverpool 15, together with the relevant details.

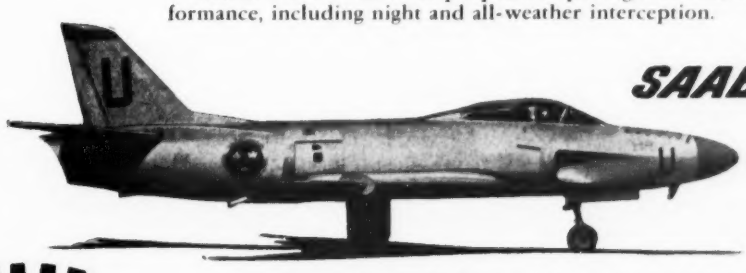


The essence of modern air defence

An Air Force whose combat planes are only day-fighters is, in effect, one armed. But strict economy, even in defence, is essential to all nations today, and so any country dependent for its safety on a powerful air defence force must choose not merely the most up-to-date and efficient aircraft, but also the most versatile and economical. Its fighter aircraft must be capable of more than one role.

The Royal Swedish Air Force has followed this principle in its procurement of combat aircraft. A striking example is the swept-wing Saab-29 jet fighter — now also available for export — which is being produced for three different military duties.

The next important step in the Swedish Air Force modernization programme is that centred around the 700 mph (over 1,100 km/h) Saab-32 Lansen all-weather jet, which has been chosen to become the standard all-weather attack aircraft. The Lansen is also most suitable for several other purposes requiring first class combat performance, including night and all-weather interception.



SAAB A 32 Lansen

a versarile and ultra-modern all-weather jet aircraft

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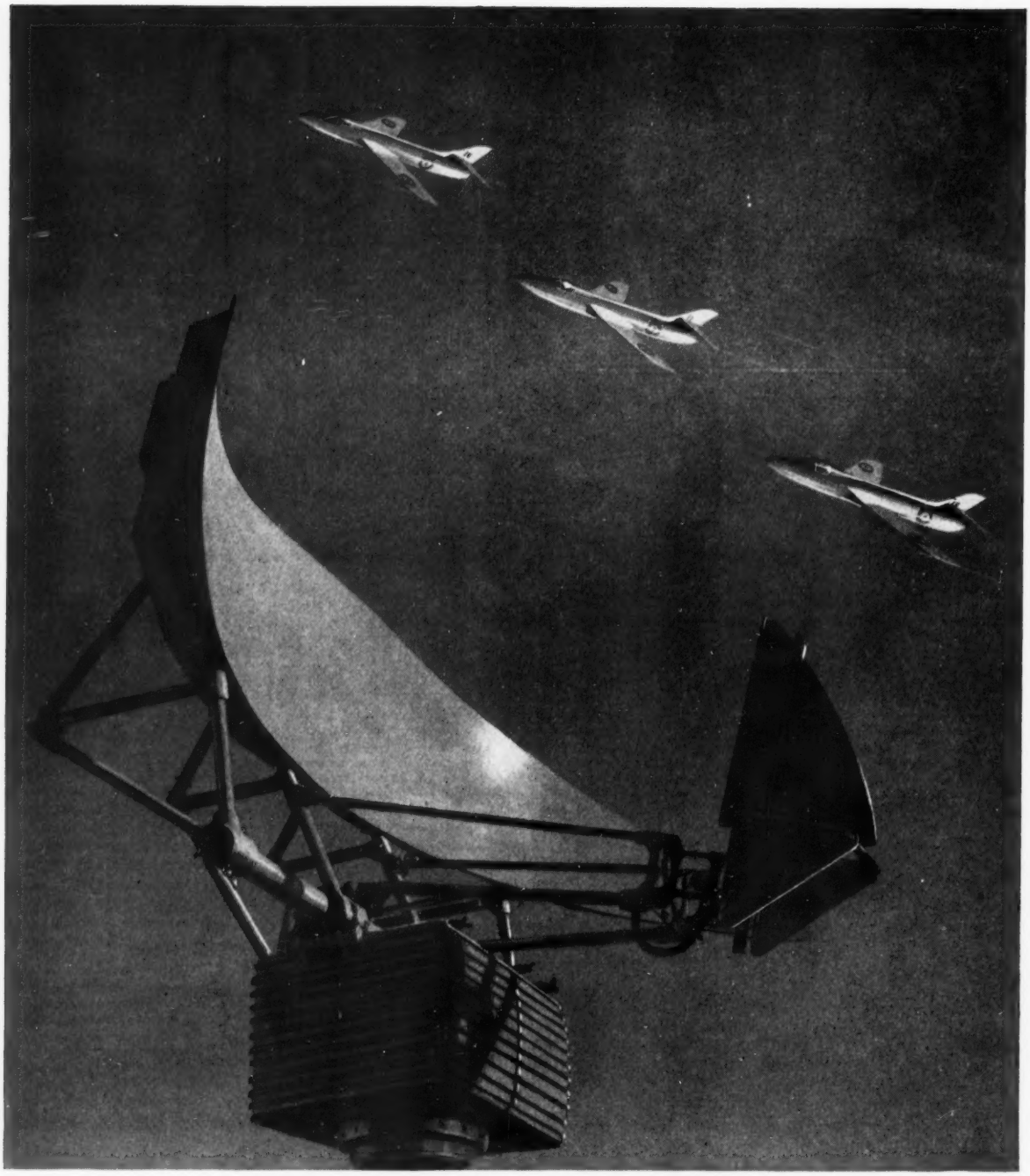

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SYCAMORE over SWITZERLAND

Pilot's Impressions of the Bristol Tour

By CAPT. PETER WILSON, T.D.

UNFRIENDLY territory for fixed-wing flying (though local pilots have evolved some excellent techniques) Switzerland offers plenty of scope for civil or military helicopter operations: mountain and lake search and rescue work, communications, ambulance flights and crop-spraying are cases in point. Recognizing this, the Bristol Aeroplane Co., Ltd., recently sent a Sycamore Mk 4 on a demonstration tour—by all accounts, a successful venture. In this article Capt. Peter Wilson, one of the company's test pilots, describes some highlights of the trip.

IT was about six o'clock on a rather dull, rainy Sunday evening when I caught my first glimpse of the Alps. It is difficult, looking back, to find the right word to describe them. Majestic certainly; and with a kind of sullen grandeur that was enhanced by heavy grey rain-clouds drifting about the white peaks.

But, to be truthful, I must add that they also looked rather forbidding, mainly because I was seeing them from the cockpit of a Sycamore I was taking to Berne for several days of demonstration flying, and because I knew that no Sycamore had ever before flown in country of that kind. Nor, for that matter, had I.

In the circumstances it's not surprising, perhaps, that none of us in the aircraft—R. A. M. Lewis was with me as flight observer and R. Francombe as flight engineer—was particularly receptive to the æsthetic appeal of the Alps at that moment.

Earlier on, about fifteen miles from Berne, we'd had our first taste of the really appalling weather that frequently blows up in Switzerland. The rain came down like a stage drop-scene, lashing the Perspex panels of the cockpit with terrific force and blotting out everything more than a few feet in front of us. It seemed to me that since we were flying in strange country, and particularly in country of this type, the prudent thing to do would be to land and wait until the storm passed, or at least until visibility improved.

We chose a suitable field near Derendingen and waited. But it was not a very long wait. Before long the weather cleared again, so completely that I began to wonder if the Swiss climate might not conceivably be even more erratic and unpredictable than our own.

Before we took off again some villagers from Derendingen came along to take a look at the Sycamore and have a word with us—in our own language. I've since wondered why they were so obviously and immediately certain that we were English. Was it the unmistakable cut of our clothes? Or merely that anyone flying round in such an odd-looking contrivance as a helicopter—this was the first they had ever seen—must be English beyond any shadow of doubt? Whatever they thought, they were certainly affable enough, and gave us a friendly wave when we took off for Berne.

Rescue demonstration on Lake Thun: One of the "large and muscular young men" of the Swiss Life-saving Society is winched aboard. A photograph taken during the course of the mountain operations appeared in our issue of October 9th.

We had a busy programme mapped out—lake and mountain rescue, and take-offs and landings at quite high altitudes in the hills near Berne. The first thing to do was to take a close look at one or two of the landing grounds; so, early on the Monday morning, I set out on a recce. in a Piper Cub flown by a well-known Swiss pilot named Gerber. He had considerable experience of flying both helicopters and fixed-wing aircraft and was able to give me some useful tips on mountain flying.

One of the basic principles, of course, was to fly mainly along the valleys, avoiding going directly over individual peaks. For I soon picked up the drill for crossing ridges; it was simply to fly alongside, making sure that you had sufficient height, and then hop over when roughly at the middle of the ridge. In this way you kept fairly clear of up-draughts and down-currents.

I was also grateful for the help of Roger White-Smith (of the Bristol helicopter sales department), who had arrived at Berne a day or so before the Sycamore and who made it his job to give me, by means of a walkie-talkie set, all the information I needed as I flew towards our mountain landing-points. Any pilot who has flown over the Alps can well imagine how helpful it was, as we made our approach, to hear a familiar voice giving wind speed and direction and some idea of the landing surface.

Our first two mountain landings were at Zimmerwald (2,700ft) and Bütschelegg (3,650ft). Zimmerwald was simple enough, but Bütschelegg I found rather tricky, with a number of pylons complicating the approach and with sloping ground which made it difficult to put down the Sycamore's three wheels with any real assurance. However, we made a number of landings and take-offs, picking up several groups of passengers and flying them around for brief demonstration flights.

Our visit had, of course, aroused keen interest and all our activities were closely watched by members of the Swiss Air Board, representatives of the Army and many well known personalities in the Swiss aviation world. Judging by their reactions on that first day of operations I was fairly certain that we had got off to a reasonably impressive start.

The next day was probably the busiest of the entire visit, with a programme including handling demonstrations, carrying underslung loads of about 150 lb, stretcher loading and unloading, removal of the Perspex blisters, passenger flights, and lake- and mountain-rescue exercises. Watched by crowds of spectators, we went through everything in one long, continuous operation, not stopping the rotors once.

The rescue exercises were particularly spectacular. For these we had the assistance of members of the Société Suisse de

The Sycamore's crew, photographed at Filton before leaving for Switzerland on September 19th. (Left to right) R. A. M. Lewis (flight observer), Peter Wilson (pilot) and R. Francombe (flight engineer).

SYCAMORE OVER SWITZERLAND . . .

Sauvetage, a group of quite the largest and most muscular young men I have ever seen. At morning rehearsals at Lake Thun, two of them, each wearing only what appeared to be the more strategic half of a "Bikini," came aboard as passengers and, from about 35ft, leapt into the lake.

The first we "rescued" by means of the winch. That is to say, we lowered the hook and raised it again with our "casualty" hanging on to it like a giant fish. His colleague then came back on board by climbing up a rope ladder.

It was interesting, in passing, to note that when our two demonstrators later gave their performance before an official audience they were wearing fairly substantial overalls. But whether this was because the lake water was a degree or two colder than they had expected, or because they felt that the actual demonstration demanded something sartorially more decorous, we couldn't decide.

The next exercise introduced us to an unusual but most efficient type of lake-rescue apparatus—a series of *papier-mâché* balls of about a foot diameter lashed together at intervals to form a life-line of about 250ft. With this in the rear of the cockpit we flew to the rescue of several people realistically posing as survivors from a capsized boat. We flew round them in a tight turn, paying out the line as we went, so laying down a sort of huge circular lifebuoy on the surface of the lake and within easy reach of the demonstrators. It seemed to me a most effective way of helping survivors at least to stay afloat until they could be picked up.

Members of the Société also demonstrated gear devised for casualty evacuation in the mountains—a rope-and-pulley apparatus known as Liberator equipment, by means of which one of them was able to descend to earth from the cockpit, controlling his rate of descent, and a harness which was similar to the "bo'sun's chair" normally used for winch rescue, except that the rescuer secured the casualty by strapping him on his back.

While we were impressed by the ingenuity of this equipment I am quite sure that people watching were equally impressed by the greater potential efficiency which became obvious when the gear was used in conjunction with the Sycamore.

The next phase of operations called for landings at higher altitude landing grounds, one of which, at Mount Gantrisch, had the dual distinction of being our highest point to date (5,400ft) and also proving almost as awkward as Bütschelegg. We had to land on a small plateau with quite a steep drop to starboard and in front, and a high ridge of hills barring our approach from any other direction. Our approach was from the valley and we had to land over the drop—not a particularly comfortable way of doing things. Even so, we took off and landed several times without difficulty at full all-up-weight of 5,400 lb.

Our highest landing point, however, was the Sanetsch Pass, some 6,600ft up, on the last day of demonstration flying. Here a new power line is being laid as part of an electrical development scheme, and we had intended to show the Sycamore off as a transport, carrying supplies and equipment into the pass from a nearby base. Unfortunately, a severe snowstorm kept us on the ground during the morning; and when, after lunch, the weather eventually cleared, it was too late to go through with the exercise.

We decided, however, that we would at least show how simple it was to take the Sycamore in. The journey from Berne to Sanetsch normally takes a good three hours—two by car, and another on foot. Our time for the complete return journey, including ten minutes' stop in the pass, was no more than an hour and a half. The significance of this performance, during which we rose to over 8,000ft on the approach, hardly needs comment.

It was, for all the Bristol team, a most pleasant trip which we shall always remember, and we are grateful to our friends of Helicoptère Suisse S.A., particularly Mr. Hoerning and Dr. Aeschbacher, for their very efficient collaboration. White-Smith assures me that the ground party is never likely to forget the car rides to the mountain landing places. There were times, I gather, when it was reassuring to reflect that the driver, Mr. Hoerning, is a racing motorist of international repute.

MINELAYING IN "MARINER"

A LITTLE-PUBLICIZED contribution to the seven-nation NATO Exercise Mariner, which ended on October 4th, was the intensive and highly successful minelaying operations carried out by Lincolns of Bomber Command. From the night of September 26th, when the Command first came into the picture, the Lincolns went out nightly to lay mines in the Thames Estuary, off the French and Dutch coasts and in the approaches to the Channel ports. Although there was night-fighter activity in these areas, on not one single night was an interception made and this success was highly rewarding to the Lincoln crews, who are in no doubt of their position *vis-à-vis* jet night fighters.

The trip which the writer made towards the end of "Mariner" was laid on by the officer commanding R.A.F. station Wittering, G/C. W. P. Sutcliffe, D.F.C., whose Lincolns, in addition to the minelayers, also took a prominent part in the simulated atomic-bomb attack on the NATO striking fleet in the Atlantic. From Bomber Command H.Q. I had a pleasant flight in a Com. Flight Oxford, piloted by F/O. Munday, flying at 3,000ft in a sunny, cloud-flecked sky.

I was invited to fly in a veteran Lincoln of No. 100 Squadron piloted by one of the squadron's flight commanders, F/L. S. E. Fawson. The Lincoln's target that night was the Harwich approaches, although in order to give the crew a reasonable exercise (and the night fighters a fair chance) our trip was scheduled to cover over 600 nautical miles. In addition to our two navigators, F/L. E. M. Williams (nav.-plotter) and F/O. W. Stevens (radar-nav.) we had on board an engineer, a signaller and a gunner.

Whilst watching our aircraft taking on her mines I was told of the squadron's new prized possession—a high-pressure petrol bowser which fills at the rate of 125 gallons a minute from each of two hoses. I also learned that the magnetic mines to be used by the Lincolns contained a charge of sodium phosphide which, on explosion, could take the paint off a vessel's side, leaving the vessel in no doubt whatever as to what she had run into! Apart from this special filling the mines were identical with the operational type. The mines were supplied to the R.A.F. by the Navy.

After a specialist briefing, during which the captain, navigators, gunner and engineer, received their individual instructions, the general briefing took place, and we were delighted to hear from the met. man that, apart from some stratus in the southernmost part of the Channel, we might expect a good run. We then adjourned for a well-cooked supper of egg, bacon and chips to fortify us against the Channel cold.

Our captain made a gentle, east-west take-off at 2045 hr B.S.T. well within the limits of the generous 3,000yd runway, and set course for Reading a minute later. Until the coast was reached we were flying at our safety height of 2,500ft and from the bomb aimer's position, with its sensation of hanging in space, one had a splendid view of the towns of Southern England passing in rapid succession. Like clusters of precious stones they blazed with light in all the colours of the rainbow. At Reading, where one pair of flashing zebra-crossing beacons seemed to stand out from everything else, we made a turn to port and headed for Selsey Bill, where we were to cross the coast. Once there the operational part of the trip began. We glided down to the required height of less than a thousand feet, navigation lights were extinguished and the rear gunner warned to keep a sharp look-out for the fighters that were expected.

Then, as our Lincoln skimmed over the sea, with only an occasional ship to break the monotony, we neared our first turning point, 20 miles north of Le Havre. Here we ran into the expected low stratus and we were able to see only an occasional light on the French coast. The second leg was along the coast to Dieppe before striking north-east to Ramsgate. At this point our Lincoln increased altitude to laying height and the crew began listening over the R/T for the safety ship—which was to broadcast last-minute instructions as to whether the mines were to be dropped or not—to give "Clear" or "Foul." We, of course, were maintaining R/T and W/T silence. On the previous mining missions the Lincolns received "Foul" and jettisoned their mines at some prearranged point, but our instructions were to take them back to base if they could not be laid.

Shortly before zero hour "Clear" came strongly over the R/T from the safety ship and our captain began his run-up. Time on target was 2300 hr and a perfect laying was made—only a few seconds late—off Orfordness. Shortly after take-off our Gee had become partially unserviceable, but the fact did not worry the crew to any extent, because on this trip we were dropping our mines by H2S. Our next leg was 80 miles east over the North Sea—presumably to give the night fighters another chance—then northwards for another twenty miles, followed by a straight run to Wittering.

On reaching the east coast our captain pulled up the Lincoln to safety height and shortly after midnight we let down on Babs to make a perfect landing. The Babs was carried out to perfection, incidentally, and earned a pat on the back from the captain.

Although the run was uneventful from the nightfighter point of view we had completed a successful mission and fully lived up to the squadron motto of *Sarang Tebuan Jangan Kijolok* ("Never stir up a hornet's nest"). We certainly hadn't stirred up any hornet's nests that night, which was precisely what Bomber Command had expected of us.

G.R.G.

THE Royal Navy, which has to maintain sea communications, regards counter-measures to the submarine threat as of first importance. Much of the new anti-submarine equipment is specialised, and demands unique capabilities and characteristics from the aircraft employed. To cover this feature of defence the Fairey Gannet is in super-priority production, and has also been ordered for the Royal Australian Navy.

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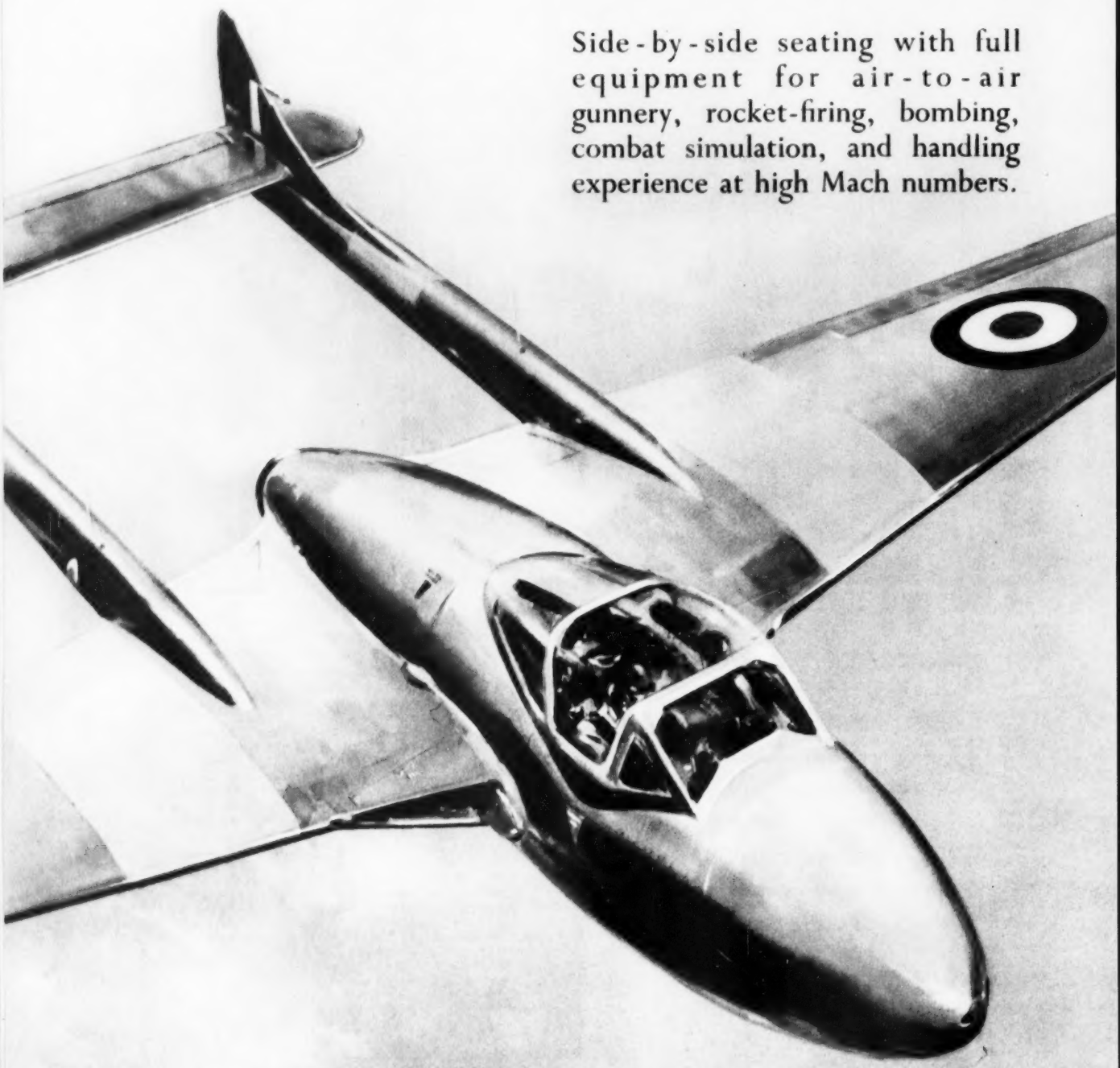

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(de Havilland Goblin engine)

While the clouds add æsthetic value to this infra-red photograph of Cornwall their presence prevented the rays from penetrating to an absolute horizon, which undoubtedly would have shown the curvature of the earth.

PHOTOGRAPHY at FORTY THOUSAND

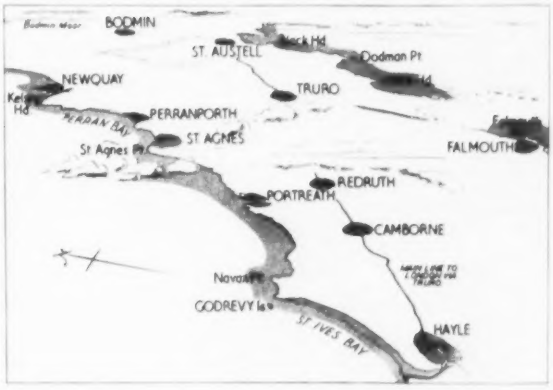
—and a Short History of No. 9 Squadron

By JOHN YOXALL

THE photographs on this and the following pages are, it must be confessed, an expression of vanity. For me, this issue of *Flight* marks the completion of forty years' service with the journal and I thought it would be appropriate to the occasion to present in pictorial form, from 40,000ft, the new and wonderful horizons brought in with the jet age. Many have gazed upward with wonder at high-flying aircraft leisurely "doodling" against a blue sky—but here such machines are portrayed from above, in all the breathtaking loveliness of their surroundings.

From the Air Ministry permission was sought and willingly given for flights to be made in the Canberras of No. 9 Squadron (S/L. J. C. M. Mountford), and no unit could have been more co-operative or enthusiastic.

Even the journey in *Flight's* Gemini up to the squadron fitted nicely into the pattern, for we passed close by Hendon airfield, where I made my very first flight—in an Avro 504 with a Gnome rotary engine. Later, as we passed Cardington, Bedfordshire, the airship sheds there brought back memories of those other big hangars, at Pulham, Norfolk, from which I had departed very early one morning in 1921 in the airship R.36 to watch the aerial control of the Ascot traffic. Speed and height apart, flying in an airship and a Canberra have much in common.



The photograph above can be interpreted with the aid of this key map. Straight-line distance from Hayle to St. Austell is 30 miles.

(Left) Beauty "in excelsis." Three Canberras of No. 9 Squadron make contrails as they pass many thousands of feet above a layer of cumulus cloud. (Below) Flying alongside the quickly forming contrails. The Canberras found no difficulty in keeping perfect formation in the rarefied air at 40,000ft.

PHOTOGRAPHY AT FORTY THOUSAND...

Both suggest the same quiet, easy mastery of space, a poetry of motion that continually reminds me of my good fortune in experiencing it.

My "seat" in the Canberra was the prone visual bomb-aimer's position in the nose, a position where one's head is parboiled by hot air defrosting the optically flat panel, and one's feet refrigerated by the hoar-frost covering the door. Ever mindful of their guest's comfort, the crew produced an inflated Mae West for use as a pillow. By the time 40,000ft had been reached (cockpit height 27,000ft) this cushion had become so hard that it was impossible even to dimple it with a finger. It was passed back to the crew to deflate before it exploded.

Photography was divided in two objectives. One was to obtain an ambitious series of pictures by infra-red, but in this I was almost defeated by the formation of high cirrus cloud. The other was to get the first-ever photographs from above of a formation making contrails at 40,000ft. Fortunately, very persistent trails were forming at the prescribed height—so much so that in flying a local circuit—via the Firth of Forth and Chelmsford !—our own trails were still apparent on the return journey.

Next year No. 9 Squadron celebrates its own fortieth birthday and it is appropriate to recall some of the unit's history and exploits.

No. 9 Squadron

The unit was formed under Major H. Musgrave at St. Omer, in France, on December 8th, 1914, with the H.Q. Wireless Unit as a nucleus. It was for a while known as No. 9 Squadron (Wireless Squadron) but the original idea was changed in order that a wireless flight could be incorporated in each of the existing squadrons. For this purpose No. 9 was dispersed and disbanded as a unit until later in April when it was re-formed with Major H. C. T. Dowding (now Lord Dowding, who was A.O.C-in-C. Fighter Command during the Battle of Britain) as its commanding officer.

After a spell of radio experimental work and training, the unit was equipped with B.E.2c aircraft and went to the Western Front. There it was engaged in army co-operation and bombing until the armistice in 1918, after which it formed part of the Army of the Rhine. The B.E.s were exchanged for R.E.8s in June 1917.

A second disbandment, in 1919, lasted until 1924, when No. 9 was brought to life again as a bomber squadron, at Upavon, with Vickers Vimy aircraft. These later gave place to Vickers Virginias.

The days of peace were spent in the annual round of training, each year culminating in the air exercises, after which the whole squadron went on leave. There was a break in this routine when the unit turned newsboy during the General Strike in 1926. Operating from Biggin Hill, it was the squadron's daily task to deliver copies of Mr. Winston Churchill's *British Gazette* to Catterick. About 17 tons were carried altogether.

By the time the second war broke out in 1939, No. 9 was equipped

Some of No. 9 Squadron's ground and air crews. In the foreground wearing flying kit are, left to right, F/O. J. N. Smith, F/O. F. W. A. Hollins, F/O. E. M. Taylor, S/L. J. C. M. Mountford, F/O. K. Hancock, Sgt. K. Neate, F/L. K. Orman and F/S. B. D. Platt.

S/L. J. C. M. Mountford, A.F.C., the Commanding Officer of No. 9 Squadron. He usually flies with his adjutant, F/O. A. P. Fletcher, as navigator.

PHOTOGRAPHY AT FORTY-THOUSAND . . .

with Vickers Wellington 1 aircraft and commanded by W/C. H. P. Lloyd (now Air Chief Marshal Sir Hugh P. Lloyd who recently retired from the R.A.F. at the end of his appointment as A.O.C-in-C. Bomber Command). It took part in the first raid of the war, against the German battleships at Brunsbüttel. Of the six Wellingtons taking part two were lost, but a battleship was hit and a merchantman set on fire.

No. 9 also had the distinction of obtaining the first decoration of the war. During an attack on Heligoland Bight in December 1939, A/C.1 Driver, a rear gunner, had his guns rendered useless and the turret floor shot away. Nevertheless he went up forward and assisted the captain by hand-pumping petrol until a forced landing was made in the sea. For his courage and devotion he received an immediate D.F.M.

In common with other squadrons of Bomber Command, No. 9 was engaged for a while on "Nickel" (leaflet-dropping) raids, but by 1941 there was steady bombing of naval and industrial targets. "Salmon and Gluckstein" (*Scharnhorst* and *Gneisenau*) in Brest harbour were, of course, included. It was in June 1941, that the squadron was unfortunate enough to lose their commanding officer, W/C. Arnold. While attacking shipping off Flushing, the Wellington he was flying was set on fire by enemy fighters. Arnold held the machine level while the remainder of the crew baled out, but he left it too late to save himself.

A month later came another outstanding case of devotion to duty. A Wellington, piloted by Sgt. Saich, was hit by flak over Bremen. With the rear of the fuselage in flames, the pilot maintained evasive action while the rest of the crew rescued the wounded rear gunner from his turret and put out the fire. Six bombs had hung up and could not be released, the bomb doors would not close, the hydraulic system was shot away and the petrol gauges showed no fuel. Yet Sgt. Saich pressed on and succeeded in landing in a barley-field in England. For this effort the pilot and Sgt. Smitten, another member of the crew, both received D.F.M.s.

During the first eight months of 1942 the Wellingtons were still in use as "heavy" bombers and operations were mostly against the Ruhr districts and naval targets in the Kiel canal. In August the Wellingtons were replaced by Avro Lancasters and the squadron moved to Waddington.

With the increased operational range of the new aircraft it became possible to attack such distant targets as Turin, Spezia and Pilsen, but it was "Berlin" that was heard most frequently at aircrew briefings for the remainder of 1942 and the following year. It was during 1943, also, that the squadron participated in the attacks on the air research and development station at Peenemunde on the Baltic coast—attacks which held up production of the flying bomb for a vital period.

September 1944, saw the beginning of a series of attacks on the German battleship *Tirpitz* in Kaa Fjord, Norway. "Tallboy" (12,000 lb) and "Johnny Walker" bombs were used, the latter being specially designed for attacking ships below the water line. The *Tirpitz* was still afloat after the first two operations, but her end came on November 12th when she capsized after a further attack by the combined aircraft of Nos. 9 and 617 Squadrons.

On January 1st, 1945, the squadron won its first Victoria Cross. While on a daylight raid against the Dortmund Elms Canal, a Lancaster was hit by heavy flak. Fierce fires broke out in the fuselage and in both mid-upper and rear turrets. The Perspex of the nose compartment was shot away and large holes in the pilot's canopy allowed a freezing stream of cold air to blow through the aircraft. There was also a big hole in the fuselage floor just aft of the cabin; there was no intercom; and one engine was on fire. The wireless operator, F/S. G. Thompson, who was uninjured, saw the unconscious gunner in the mid-upper turret and immediately went back into the flames and exploding ammunition. He pulled the gunner from his turret and, edging his way round the holes in the floor, carried him to comparative safety, extinguishing his burning clothing with bare hands. Thompson himself was severely burned on face and hands; one trouser-leg was scorched off, and his pain was aggravated by frostbite due to the icy blast from the shattered nose. But again he went back, this time to the tail gunner, who was unable to get himself out of his turret. Thompson carried the gunner the length of the fuselage and beat out the flames from his smouldering clothing with his hands. By this time his condition can only be described as pitiful—so bad, in fact, that later his pilot did not recognize him. The gallant wireless operator died of his injuries three weeks later and was posthumously awarded the V.C.

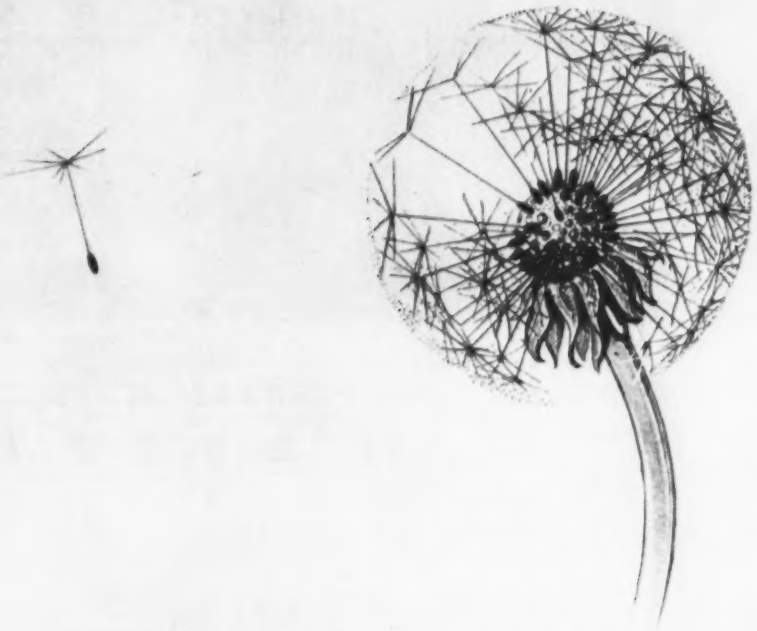
The final raids of the war in Europe were against Hitler's "Eagle's Nest" at Berchtesgaden, and when Germany capitulated the unit immediately started training to become part of the projected "Tiger Force" for the Far East. But before No. 9 could get to that theatre of war the Japanese gave in and the scheme was abandoned. Since the end of hostilities the unit has suffered the usual demobilization troubles and shortage of manpower. The Lancasters gave place to Lincolns and these, in turn, were discarded for the present Canberras. The first flight in a squadron Canberra took place on May 2nd, 1952. One of the most interesting flights was that of Canberra WD999, which F/L. F. Moysey and F/L. G. Barber took to Woomera, Australia, for special trials. The first leg of this journey, to Malta, was covered in three hours exactly and the longest, from Singapore to Darwin, was completed with "only a smell of fuel left in the tanks." It was from this aircraft, now painted white, that the formation contrail photographs on the previous page were taken.

The motto of No. 9 Squadron is Per Noctem Volamus *("We fly by night.")*

Commanding Officers of No. 9 Squadron

Maj. H. Musgrave	8-12-14	W/C. J. M. Southwell, D.F.C.	14- 9-42
Maj. H. C. T. Dowding	1- 4-15	W/C. K. B. F. Smith, D.S.O.	15- 3-43
Maj. F. A. Wanklyn	16- 9-15	W/C. Burnett, D.S.O., D.F.C.	28- 3-43
Maj. A. B. Burdett	25- 3-16	W/C. E. L. Porter	14-11-43
Maj. I. A. E. Edwards	10-12-16	W/C. J. M. Bazin	2- 5-44
Maj. H. J. F. Hunter	29 -5-17	W/C. R. F. Dupont	3- 3-45
Maj. J. T. Rodwell	16-11-17 to July 1919	W/C. Osborne	26-11-45
W/C. H. P. Lloyd, M.C., D.F.C.	2- 1-39	S/L. Watkins	15- 5-46
W/C. R. A. A. Cole	27- 9-39	S/L. Overton	12-12-46
W/C. A. McKee, A.F.C.	17- 1-40	S/L. Flynn	2- 5-47
W/C. Healy	24- 7-40	S/L. Wilson	11-11-47
W/C. Arnold	16- 1-41	S/L. Ostle	20- 8-48
W/C. K. M. M. Wasse	20- 6-41	S/L. Southall, D.S.O., D.F.C., A.F.C.	17- 8-50
W/C. Inness	4- 4-42	S/L. J. C. M. Mountford, A.F.C.	24-11-52

When thinking of the Lightest . .



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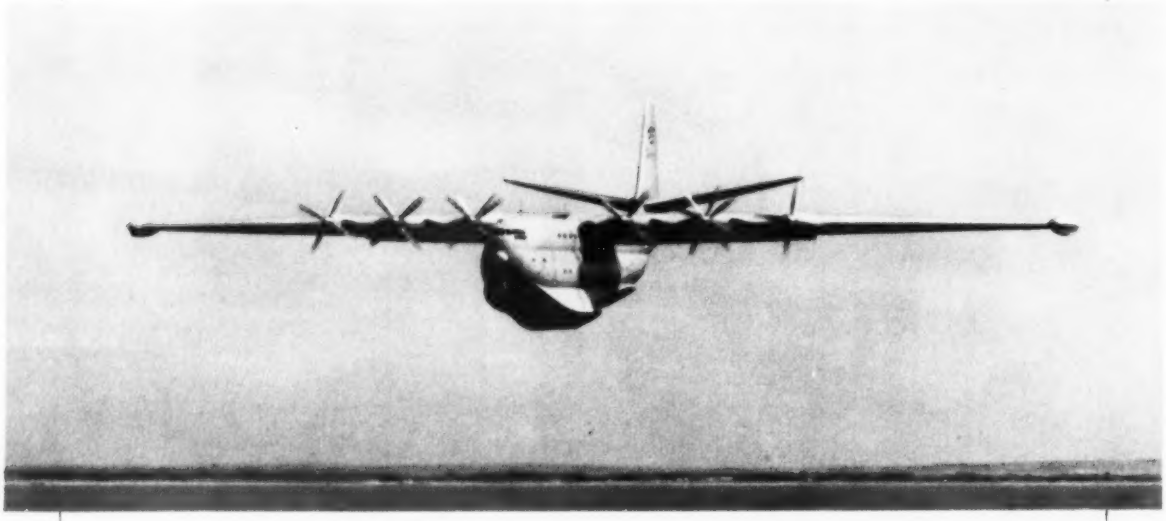

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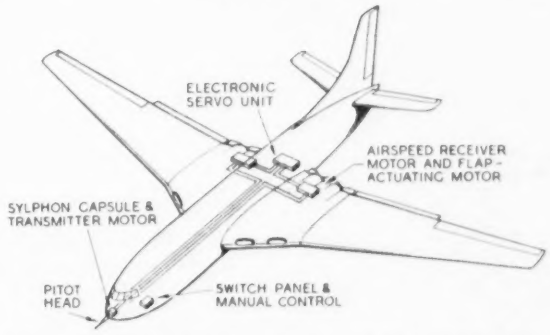
AUTOMATIC FLAP-CONTROL

Details of a Suggested Electronic Servo-system

THIS article is a condensed version of a paper by Mr. W. J. Gatehouse, who feels that there would be considerable advantage in relieving pilots of the necessity for flap-operation during landing and take-off; he proposes, and describes, an electronic system in which application of flap would be automatically dictated by air-speed. He has clearly made a painstaking study of the problems involved and there appears to be no reason why his system should not work. We think, however, he will find quite a number of pilots to be chary of having such a vital operation taken out of their hands.

EVOLUTION has resulted in the installation of an incredible number of "essentials" contributing towards making aircraft proof against accidents. Since, however, many of them are merely tools at the disposal of the pilot, rather than automatically operated safeguards, they actually expand the field of human fallibility and provide further sources of pilot error. In the author's view, a higher degree of automaticity is required to assist the pilot in his ever-increasing task.

Such automaticity would have its greatest value during the critical landing and take-off phases. Trailing-edge flaps or other high-lift devices are at least partially extended before the aircraft begins to lose height on the final approach, and will be fully extended by the end of the approach. During this stage the pilot must be able to vary his rate of descent to correct for errors in judgment and the effect of wind; and the ease with which such correction can be made will depend to some extent on the maximum gliding angle at the approach speed. This in turn depends chiefly on the drag of the aircraft, and one of the uses of the flap is to provide extra drag for this purpose. Furthermore, to enable the pilot to make accurate approaches it is necessary to provide him with a good field of view forward and downwards. The view can always be improved by reducing the incidence used on the approach, and the trailing-edge flap forms a convenient method of achieving this end. A means of rapidly changing the lift coefficient without altering incidence can provide the pilot with a useful control for making rapid adjustments to his approach. Thus, the changes in lift coefficient may be obtained by rapidly altering the deflection of the trailing-edge flap.


ELECTRONIC SERVO UNIT
AIRSPEED RECEIVER MOTOR AND FLAP-ACTUATING MOTOR
SYLPHON CAPSULE & TRANSMITTER MOTOR
PITOT HEAD
SWITCH PANEL & MANUAL CONTROL

A suggested scheme of installation (not to scale) for the principal components of the automatic-flap system.

Trailing-edge Flap.—The use of trailing-edge flap to increase the maximum lift coefficient of the basic wing is now almost universal. The split flap is probably the simplest type, and it increases the lift coefficient by effectively increasing the wing camber without affecting the angle of attack. Maximum lift increase is usually achieved with the flap deflection of 70 deg or 80 deg. For other types of flap, the increase occurs somewhat earlier. Trailing-edge flap reduces the landing distance by reducing the speed at touch-down and thus reducing the energy which must be dissipated by the brakes and tyres. We may conclude, then, that use of such flaps has a very marked effect on the approach and flying characteristics of an aircraft.

Change in Trim.—The pitching moment due to the use of flap is always a nose-down moment and is directly proportionate to the increment in lift coefficient. These moments have a large influence on the change in trim. This change results from two opposing effects: (a) the change in pitching moments on the wing as the flaps are deflected, which gives a nose-down moment; (b) the increase in downwash over the tailplane, which gives a nose-up moment.

To counteract these effects it is necessary to have a trimmer device positioned on the elevator which changes the elevator angle to trim out the pitching moments on the wing. This in turn is dependent on the tailplane volume. The bigger the tail the smaller is the elevator angle required to give a particular pitching moment. This immediately introduces complication in design, by reason of the fact that tail volume is determined by stability requirements.

Ground Effect.—In aircraft with moderate tail-volume, trouble has sometimes developed during take-off and landing, by reason of insufficient elevator power. This is caused by the "ground effect," which alters the trim of the aircraft in the following way: (a) by altering the lift in the tailplane at a given incidence; (b) by altering the downwash over the tailplane. The change in the lift may be quite considerable in certain types of aircraft with low-set tailplanes.

Automatic Flap.—Reflection for a moment on all these variable factors, which can so greatly influence the landing and take-off manœuvres of an aircraft, suggests that we must concentrate on a device which gives us the maximum amount of efficiency at these critical periods. The distance required by an aircraft to accelerate from rest to climbing speed is, we are told, proportional to the square of the climbing speed, or inversely proportional to the maximum lift coefficient. The drag during this stage is not important. The distance covered during the climb to a height of 50 ft is chiefly dependent on the difference between the thrust and the drag. If the maximum lift coefficient of an aircraft in take-off manœuvres is steadily increased the drag coefficient will also be increased, partly because of the profile-drag of the flap but mainly because of an increase in induced drag. To keep this drag figure to a minimum we want a device which automatically gives progressive efficiency of the flap surface during the varying loads and accelerated speed of the aircraft—in other words, a proportional reduction of the drag figure with increasing speed; such an operation is beyond the capability of the human being and may be said to extend into the realms of the "mechanical brain."

Similar considerations apply in the landing operation. The flap is partially extended before the aircraft begins to lose height and fully extended by the end of the approach, and during this stage the pilot must be able to vary his rate of descent to correct for error in judgment and the effect of wind gradients. The main purpose of the flap in this manœuvre is to provide extra drag necessary for corrective action by the pilot. The automatic flap can increase efficiency in this respect, because the incidence of the approach will be determined by the stalling incidence and the margin in speed above stalling speed required for safety. An automatic flap, functioning and biased to operate at around a specified landing speed, could increase or decrease drag or lift, so giving constant approach conditions. Automatic flap could compensate for change in aircraft trim, although the use of airbrakes or spoilers may have to be considered to increase drag under such conditions.

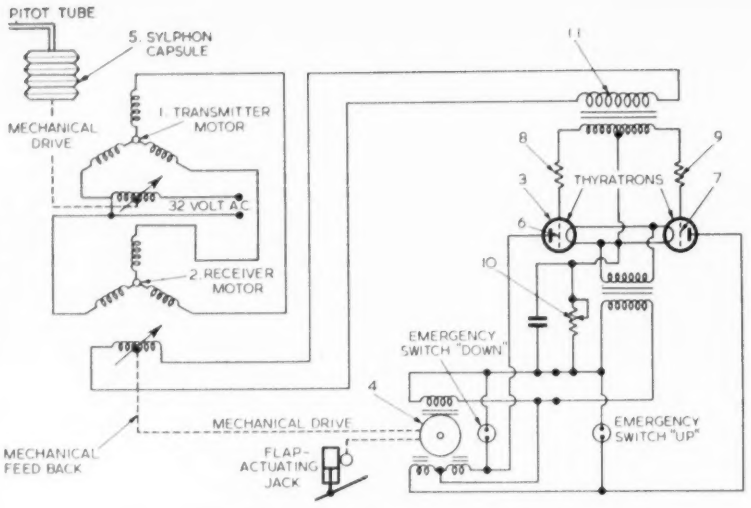
Electronic Automatic Control of Flap Mechanism.—Fully automatic control of flap is the next consideration. Flap angle can be expressed as proportional to the air-speed of the aircraft—less speed, more flap, and *vice versa*. By making use of this proportionality an electronic servo system functioning as a flexible yet positive coupling between an air-speed transmitter motor and a reversible electric motor could be used. In the arrangement envisaged (see diagram overleaf), a transmitter motor (1) (which could be positioned in the nose of the aircraft) operates, with the aid of a pitot head, proportionately to the air-speed of the aircraft. The pitot head communicates with a sylphon capsule which is coupled mechanically to the rotor of the transmitter motor. The rotor is energized by an external source of alternating current, and this current creates a magnetic field around the rotor, which in turn induces a current in the three stator windings of the transmitter motor.

The current thus induced in each of the stator windings will be proportional to, and be a representation of, the transmitter motor's rotor-angle. The stator windings of both motors are connected in parallel and thus the same current flows in the stator windings of both, thereby producing a similar magnetic field in the receiver motor (2).

Now, whenever the rotors of the two motors are not in alignment with each other, a voltage will be induced in the rotor

AUTOMATIC FLAP-CONTROL . . .

The circuits in Mr. Gatehouse's suggested flap-control system. The numbers refer to the detailed description beginning on the previous page and continued below.



windings of the receiver motor. This induced voltage is then proportional to, and is a representation of, the relative motor displacement. Any voltage thus induced in the receiver-motor rotor windings is then fed to the grids of two thyratron valves (6) and (7) of the electronic servo unit through an input transformer (11). This transformer increases this voltage and applies it in "push-pull," through two fixed resistors (8) and (9), to the grids of the thyratron valves.

The anode of each valve is connected through the respective shaded coils of a reversible motor (which will be positioned in the aircraft mainplane, and will control the movement of the mainplane flap) to one side of an external power supply. The other side of the power supply is connected to the filament circuit of the thyratron valves to complete the anode circuit. A resistor (10) can be placed in the circuit to reduce the current through the valves and shaded coils of the flap motor. A capacitor can be fitted to correct any undesirable phase-shift introduced by the resistor or the shaded coils of the flap motor.

Operation of Electronic Servo Unit. — As we have seen, a voltage is induced in the receiver-motor rotor winding (2) whenever the rotor of the transmitter motor is displaced. This voltage, fed to the grids of the thyratron valves, is essentially "in phase" with the line voltage. (The input voltage leads the line voltage 90 deg if the rotor is displaced in one direction, and that causes it to lag by the same amount if displaced in the opposite direction.) Since the grids of the thyratron valves are of opposite polarity, the direction of the receiver rotor displacement determines which grid will be positive, and which will be negative during a positive half cycle of the anode circuit; this determines which valve will conduct current. The current conducted by the valve having the positive grid is applied to the respective shaded coil of the reversible motor situated in the aircraft mainplane, thus causing operation of the flap surfaces. The flap motor is also coupled mechanically back to the receiving receiver motor, which is driven in the correct direction for alignment with the transmitter rotor. As alignment is approached the valve having the positive grid becomes less conductive, while the other becomes slightly conductive over each positive half-cycle, and causes some current to be applied to the other shaded coil of the flap motor. This has a braking effect on the motor, tending to reduce its speed as the receiver motor approaches alignment. When both transmitter and receiver motors are in direct alignment with each other, the induced voltage in the receiver motor rotor circuit drops to zero and the flap motor stalls and remains stationary, since both thyratron valves conduct equal current.

If it were found in practice that the thermionic valve amplifier was insufficiently shockproof, it could be replaced by a transductor magnetic amplifier system.

Installation in Aircraft.—Installation would not present formidable difficulties. The system can be divided into three distinct units, controlled from a panel in the cockpit:

(a) *Sylphon Capsule and Air-speed Transmitter Unit,* which will be positioned in the nose of the aircraft in close proximity to the pitot head.

(b) *Electronic Servo Unit,* positioned in any accessible position along the fuselage and so arranged that maximum advantage is taken of available space, while also taking into consideration servicing requirements (the unit could be installed on a removable servicing tray).

(c) *Receiver Motor and Reversible-flap Motor,* positioned along the trailing edge of the aircraft, in the vicinity of the flap operating lever.

Conclusion.—We now have a flexible automatic device which may well be the forerunner of automatic landings and take-off. The advent of jet-powered aircraft is demanding landing and take-off conditions at constant engine power and, indeed, we know that jet engines mostly operate with efficiency near to their maximum speed, while their variable speed range is not so great as that of the conventional piston engine. With an automatic flap control device, jet aircraft could land and take-off at constant engine power, giving increased engine and aerodynamic efficiency, the speed of the aircraft being regulated by automatic flap application according to the optimum landing and take-off speeds required.

AIRFIELDS ON THE GRAND SCALE

SOME months ago—on April 10th—we were able to quote some impressive figures in connection with constructional work on an airfield site "somewhere in the Midlands." The details given were taken from *Team Spirit,* the monthly news sheet issued by John Laing and Son Ltd., the well known firm of contractors. In the October number of the same publication there is another informative account, some passages from which we quote below.

When Brize Norton first appeared on the list of contracts in the summer of 1950 (says *Team Spirit*) most people knew little more about it than the fact that this contract for the Air Ministry was for the supply of materials and services for a United States air base in this country to be constructed by U.S. Army Engineers. To many this appeared to be an easy contract involving the placing of a few orders and watching the materials duly arrive. But far from this being the case, Brize Norton soon developed into Brize Norton, Fairford and Upper Heyford—or what have been named the Midland airfields supply contracts—amounting to contracts to the value of £3¼ million, followed by Wethersfield and the current contract, Stansted Mountfitchet.

With the three Midland airfield contracts running simultaneously during a period of 27 months up to January of this year, the supply of materials in the vast quantities required was a major operation. Here was a task involving careful organization, for when ordering takes place on such a large scale for delivery at sites situated no more than 20 miles apart, the responsibilities become great and often extend beyond the usual limits expected by a contractor. At one time such a heavy demand was made on transport that a nation-wide appeal for lorries was made and vehicles were diverted from all parts of the Midlands and the north-west.

Site offices were established at Brize Norton to serve as headquarters for the three contracts, and the focal points of activity at the individual sites were the weighbridges. Here there was a scene of sustained activity, for over the relatively short period of 27 months more than two million cubic yards of filling materials, half a million cubic yards of concreting aggregates, three-quarters of a million tons of cement and a quarter of a million yards of bituminous macadam aggregates, to mention only a few of the items, passed over the three weighbridges. At Brize Norton and Fairford the handling of hot bitumen was a considerable item. This was supplied in road tankers and discharged into steam-heated tanks to be maintained at the correct temperature until used for the manufacture of macadam. At Upper Heyford nearly 150,000 tons of ready-made bituminous macadam was supplied.

At the three sites materials were supplied for more than 30 miles of fencing, calling for some 24,000 concrete posts.

In the trio of Mk 3s from 445 Squadron (right) the machine nearest the camera is carrying big tip-tanks. In the Mk 4 the cabin air intake has been moved to the top of the fuselage for, in the under-fuselage position shown, it might pick up spent links and gun gas from the "eight-fifties" (which, on No. 138, do not appear to have been fired). A 445 Squadron line-up is seen below, at North Eay.

DEFENDER of the DOMINION

The Avro Canada CF-100 in Service

IN our 1950 special Military Aircraft of the World Number we wrote: "The section of this issue which deals with fighters makes it clear that, of all classes, that most urgently required is the all-weather machine, furnished with the most complete and up-to-date electronic aids. It will be judged, moreover, that such aircraft present severe design problems, and it is especially gratifying therefore, that the most promising example is the Avro Canada CF-100." Soon after those words appeared they were quoted by Air Marshal W. A. Curtis, then Chief of Staff of the R.C.A.F., in a message to members of that force.

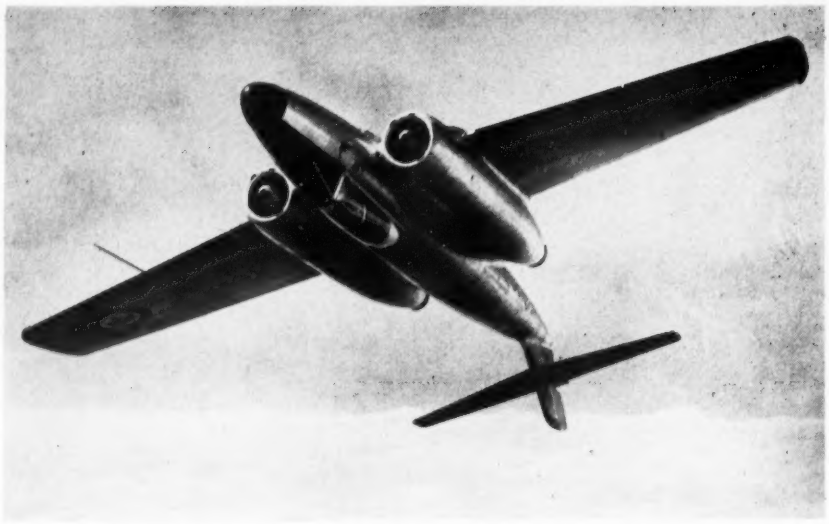
Since that time the promise has been fulfilled, and the CF-100 is now rolling off the Malton production-line in increasing quantities. Outstanding, on external inspection of the CF-100, are the great height and length of the aircraft; 53ft separates the nose radome from the gaily-painted tail. The quality of construction is high and everywhere is evidence of the use of modern tools and procedures. The thick skin is unpainted, as befits an aircraft raised in North America. Beneath it lie masses of electronic gear, armament, tankage and all the other thousand and one things that make an operational fighter. About half this equipment is British, the remainder of American origin. The weight of the CF-100 is nearly 20 tons, and this load is taken by double-wheel landing gear with Dowty Liquid Spring legs.

Altogether, the CF-100 can truthfully be described as "a whole lot of airplane." In fact, it is not immediately apparent why so expensive an aircraft should be attempted by the young Canadian industry—until one recalls the opening paragraph above. The air defence of Canada poses unusually severe problems. The Dominion's northland is a vast area of lake and tundra, sparsely inhabited and largely devoid of ground communications. In spite of the present considerable expenditure in this regard, it is impracticable to cover this region with an airfield and radar network in the usual sense of the word. Whatever fighters can be provided need to be extremely long-range high-performance aircraft capable of operating in the worst weather in the world. The CF-100 is designed to do all this and is, into the bargain, a formidable opponent and a pleasant aircraft to fly.

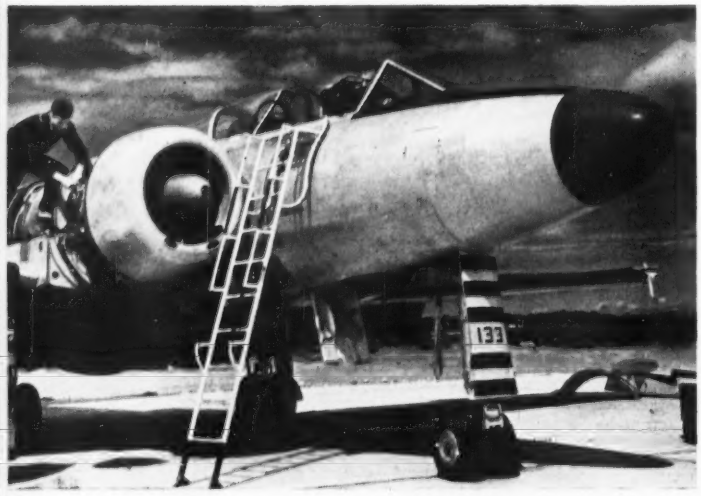
This sort of aircraft, particularly when allied with an entirely new engine, forms an ambitious programme for a new company to attempt, even when that company is the largest unit of the Hawker Siddeley Group, with 13,000 on its payroll. Since the Avon-powered black-painted prototype flew early in 1950, a great many man-hours and dollars have been needed to develop the CF-100 and its engine to their present efficiency; but this development has not been unduly long, and the Hawker-Siddeley Group has good reason to congratulate itself on the outcome.

The original Mk 1 carried out its test flying with Rolls-Royce Avons, for the Avro Orenda was not then cleared for flight. It

DEFENDER OF THE DOMINION . . .



The striking roll shows the agility of this 17-tonner—manœuvrability which has been further improved on the Mk 4. Below, a domestic close-up shows the size of the aircraft, the height of which is underlined by the ten-step ladder. The gun pack is away from this machine, for purposes of re-arming.



was followed by the Mk 2, a pre-production type, half of which were retained by Avro Canada for experimental development. The Mk 3 was the first true production machine; the production run for this mark began in September 1952, and was completed ahead of schedule in July this year. The Mk 3 is now in multi-squadron service with the R.C.A.F., the first deliveries having been made to No. 3 all-weather O.T.U. at North Bay, Ontario, commanded by G/C. F. R. Sharp.

For over a year this O.T.U. has handled CF-100 conversion, all-weather training, and development of procedures, including high-altitude interceptions, and ground-level close-support work. Earlier this year, two regular fighter squadrons, Nos. 423 and 445, were formed at North Bay, these being the first CF-100 operational units. No. 445 Squadron recently moved to Uplands, Ottawa, to take the place of the Sabre wing which is now stationed at Baden-Soellingen. Several of the accompanying photographs are of aircraft of 445 Squadron, which are distinguished by striped rudders and nosewheel doors and insignia resembling a flash of lightning.

Armament of the Mk 3 consists of eight 0.5in guns, mounted around the floor of a large ammunition-tank which slides into the belly of the aircraft forward of the wing. This tank can be refilled and serviced on the ground and clipped into place in a few minutes; it is, we believe, one of the results of the R.C.A.F.'s extensive cold-weather research at temperatures far below zero. Used in conjunction with this powerful armament is comprehensive airborne search and gunsight radar; the gun pack and nose radome are prominent in the illustrations. Also clearly visible are the black de-icers over the leading edges of wings and tail, such equipment being essential on a machine of this type. The black strips are rubber sheaths housing electric resistance wires; the Orendas are de-iced by alcohol sprays, and Nesa electrically heated glass is used for the outer windscreen.

Jan Zurakowski examined the Mk 3 carefully when he joined Avro Canada last year. We have been told that it was on his recommendation that modifications were made to the airframe which resulted in the supersonic Mk 4. The first Mk 4—the subject of the three-view drawing on this week's *Aircraft Intelligence* page—was originally one of the Mk 2 development machines. Zurakowski took it closer and closer to Mach 1, eventually going sonic on December 18th last year. This transonic programme had, according to Avro Canada, three purposes: to establish that the aircraft was completely controllable at transonic and sonic speeds; to remove present speed restrictions and eventually get a no-limitation rating on speeds at high altitudes; and to show R.C.A.F. pilots that, if they had to dive to attack or escape, the CF-100 was powerful enough and structurally sound enough to enter the sonic zone.

The Mk 4 is not only supersonic but has an entirely new armament—up to 100 folding-fin unguided rockets carried in the wing tips. This installation was developed with a Mk 3 at a range over the southern shore of Lake Ontario, during the earlier part of this year. The Mk 4 also has the more powerful Orenda 9, and is faster and more manœuvrable than earlier CF-100s. Most important of all is the new and blunter nose, manufactured by Hughes Aircraft, of Culver City, California. This houses the latest automatic search and lock-on intercepter fire-control system, hitherto carried only by aircraft of the U.S.A.F.

Today, the first Mk 4s are just coming off the production line after a re-organization of the entire Avro Canada factory, in the course of which 15,000 new tools, dies and jigs were installed. This was required partly to meet the changed structure of the new fighter, and partly to permit the enormous Mk 4 production schedule, which is to reach its peak in the early months of next year. Although Avro Canada have other projects—which might be described as "revolutionary"—under development, CF-100 production will probably remain their main product for some years to come.

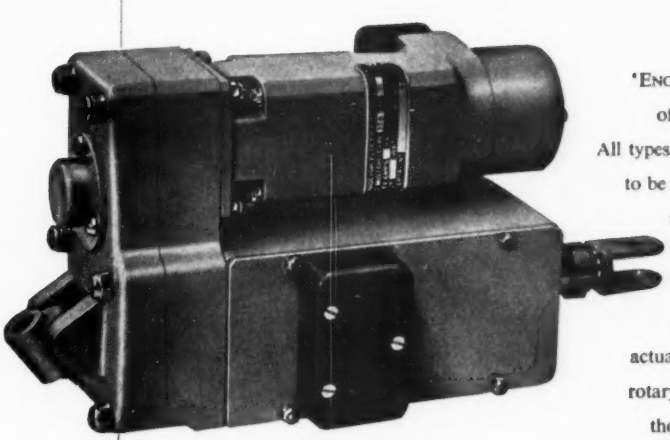
It is the intention that every fighter squadron to be based in Canada will be equipped with the CF-100 Mk 4. Additionally, three Sabre squadrons of the R.C.A.F. Air Division serving in Allied Air Forces, Central Europe, are scheduled to be replaced by all-weather units. Altogether, the CF-100, an aircraft and engine without any heritage or background whatever, is a machine for which the western world may be very grateful.

A.D.A. EXECUTIVE APPOINTMENTS

THE Aluminium Development Association announces a number of changes in the membership of its council and executive committee. They are as follows:—

Council.—Mr. H. E. Jackson has resigned following his retirement from the Board of Imperial Chemical Industries, Ltd. (Metals Division), and his place has been taken by Dr. Maurice Cook. Mr. G. A. Woodruff has resigned on retiring from J. Stone and Co. Ltd.; he represented L.M.F.A. Development, Ltd., on the council and his place has been taken by Mr. J. F. Paige of William Mills, Ltd. Mr. C. W. Cumber, representing Richard Thomas and Baldwins, Ltd., has resigned on taking up an overseas appointment with his company; his successor on the council has yet to be appointed.

Executive Committee.—On his appointment to the council, Dr. Cook has been succeeded on the executive committee by Dr. N. P. Inglis. Mr. F. G. Woollard has resigned, following his retirement from the Birmid Group, and his place has been taken by Mr. Harold Goodwin of Birmetals, Ltd. Mr. F. R. C. Smith has also resigned, since in his new position in the Aluminium, Ltd., Group it was impracticable for him to continue to represent Aluminium Laboratories, Ltd., on this committee. Mr. J. H. Mayes of Northern Aluminium Co., Ltd., takes his place.



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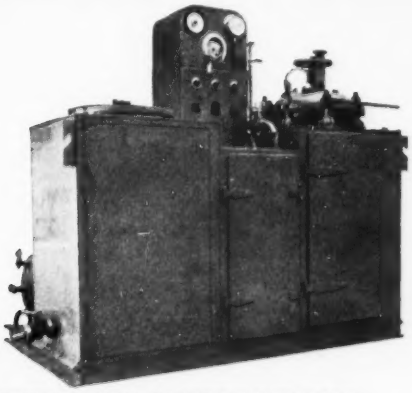

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Brit. Pat. App. Nos. 21003/50 & 18440/51 Foreign Pats. Pending

IMPRESSIVE NEW FACTORY of Dowty Equipment of Canada, Ltd., at Ajax, Ontario. As we recorded last week, it was opened on October 13th by A.V-M. Douglas Smith, R.C.A.F., Air Member for Technical Services. (Above) Mr. G. H. Dowty is seen leaving London Airport by B.O.A.C. Stratocruiser to attend the ceremony.

THE INDUSTRY

Westland Board Appointment

A PRACTISING chartered accountant, Mr. Walter Oppenheimer, F.C.A., has been appointed to the Board of Westland Aircraft, Ltd., in which position he will be director in charge of finance. For some time past he has acted as Westland's financial adviser and has been secretary of Light Machines, Ltd., Yeovil, from that company's inception. Both Westland and Light Machines are associated companies of John Brown and Co., Ltd.

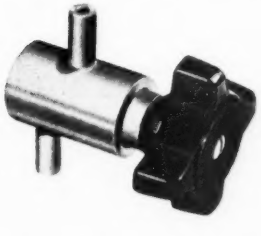
Maj. Willans's New Post

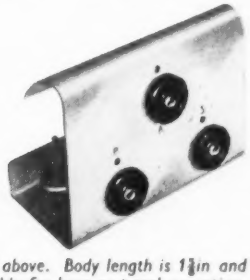
THE belief that the G.Q. Parachute Co., Ltd., are busy with new projects is strengthened by the news that Maj. T. W. ("Dumbo") Willans was recently appointed as the company's technical sales executive. His duties will include live testing of parachutes and associated equipment. Maj Willans's eleven years of practical parachuting experience includes a period of service (from 1945 to 48) with the Army Operational Research Group as a deputy assistant director of scientific research. In 1949 he made the first descent with the Irvin barometrically operated parachute, and two years later he represented Britain at the World Parachuting Championship, held in Yugoslavia, gaining fourth place. For the past two years he has been engaged by Irving Air Chute of Great Britain, Ltd., for work on high-altitude parachuting research. Maj. Willans was this year appointed president of the F.A.I. Parachuting Commission. He has, incidentally, broadcast and written on parachuting; readers will recall his "This Way Out" (*Flight*, August 14th, 1953).

"Dumbo" Willans.

Sensitive Control Valves

ILLUSTRATED below is one of a series of sensitive control valves introduced by Rollason Aerocessories, Ltd., of Croydon Airport, for use in test-equipment control panels and similar applications. It is designed for incorporation in compressed-air or vacuum lines, while other versions, utilizing appropriate materials for certain parts, can be supplied for controlling various fluids.





(Left) Rollason control valve, described above. Body length is 1¾in and diameter 1in, and the fitting is adaptable for base or panel mounting. (Right) Three-valve test-panel; finish is in hammered grey enamel.

Subject of a patent, the cone which controls rate of flow is a floating member seating on a Hallprene ring but normally held towards the open position by a compression-spring. Flow-reduction is effected by screwing-down the control-spindle. As the spindle moves downwards it depresses the spring-loaded cone, but there is no rigid connection between these two members; a flexible (Hallprene) diaphragm is interposed, effectively sealing-off the pressure side of the valve from the rotating assembly. A brass thrust-pad prevents the spindle-end from bearing directly on the diaphragm. Stop-pins are incorporated to limit motion where necessary.

The valve—which, it is stated, can be operated with a very light touch over its whole range—is available in three sizes, ⅛in, ¼in and ½in B.S.P.; the ¼in size can be supplied with ¼in plain connectors. These sizes are available in "sensitive" versions, giving full travel by two and four turns of the control-knob respectively.

Also illustrated here is a control panel introduced by the same firm for use in instrument-testing equipment. Operating on the principle described above, the three valves control pressure, suction and release-to-atmosphere. The necessary connections to the test-supply and the instruments are at the rear of the panel.

IN BRIEF

Vickers, Ltd., and Cammell Laird and Co., Ltd., have opened conversations with the Iron and Steel Holding and Realisation Agency for the repurchase of interests in English Steel Corporation, Ltd. If and when agreement is reached, state Vickers, a further announcement will be made.

* * *

The directors of the Bristol Aeroplane Co., Ltd., have declared an interim dividend of 3½ per cent (subject to income tax) for the year ending December 31st, 1953, on the £4,620,000 Ordinary stock as increased by the 40 per cent scrip issue on January 1st, 1953. It is stated that this represents, as nearly as is conveniently practicable, the same gross interim distribution as last year.

* * *

At the annual general meeting of the Fairey Aviation Co., Ltd., to be held on November 12th, the chairman's review of results for the year ended March 31st, 1953, will show group profits of £948,638, as compared with £804,832 for the previous year. Greatly increased taxation provision, however, will reduce net profit to £295,686 (last year, £382,994). Recommended dividend remains unchanged at 2s 6d per share, less income tax at 9s.

* * *

At their recent annual general meeting of Newton Brothers (Derby) Ltd., manufacturers of aircraft and other electrical equipment, the chairman, Mr. F. V. Pipe, O.B.E., A.M.I.E.E., announced a trading profit of £181,625, compared with £150,070 for the previous year.

* * *

Newton Victor, Ltd., specialists in medical and industrial X-ray equipment and supplies, have concentrated their head office organization in larger premises at 132 Long Acre, London, W.C.2 (Covent Garden 0861; telegrams, Stabilizer, Rand, London).

* * *

An informative, well-illustrated brochure entitled *Cement Concrete in Aerodrome Construction* has been published by the Cement Marketing Co., of India, Ltd., 1, Queen's Road, Bombay. The author is W/C. R. Vaughan-Fowler, who was senior aerodrome-inspection officer for the R.A.F. in India, 1940-1945.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

He'll Take the High Road!

JUST when American crystal-ballsters were prophesying a significant shift to the turboprop engine as a better answer to future airline requirements than the turbojet, Pratt and Whitney announce the withdrawal of the commercial version of their big T34 turboprop on the ground of no commercial takers. Contrary to high expectations in many quarters, American airline operators have not yet shown sufficient interest to place orders for turbo-propped Super-Connies and DC-9s. It is likely, of course, that the suspension of the 5,600 hp PT2F-1 is only temporary, due to the fact that the current market price is too steep. Another guess is that the operators have had second sight and are swinging back to the turbojet, following the lead of PanAm.

Engineers in the business are once again called upon to go through more design exercises to show the relative merits of the two types of gas turbine. It should be obvious by this time to airline operators (and yet apparently it is not) that the speed-altitude spectra are different for the turbojet and turboprop. Broadly speaking, I believe that the future of long-distance passenger air transportation lies in the higher and faster domain of the pure jet, while the turbined windmills will be harnessed for the carriage of cargo at lower speeds and altitudes. It's almost as simple as that !

What, however, is not so simple is the fact that it takes at least five years to design and develop a reliable turboprop. (As a matter of fact, the T34 has, so far, taken a full seven years.) Kelly Johnson, chief engineer of Lockheed, has rightly pointed out that the turboprop is much more complex than the turbojet, since it has all the pure-jet-engine problems in the power section, a much more complex fuel system, and the further bugaboo of a big gearbox with high-speed shafting and a weighty airscrew. The airscrew and gearing, moreover, involve a tricky starting and idling problem because of the high inertia and starting drag.

But aside from all the polemics, whether technical or economic, the clinching argument for the passenger and the turbojet is the ever-the-weather comfort factor; in other words—height. This may be a bit more intangible to figure in terms of £ s d, but it is closely allied with the passenger load factor, since passengers who have had the alarming experience of being bounced up to the ceiling (or strapped down in their seats), while ploughing through the troposphere in a thunderstorm, are hardly likely to come back for more. Next time, they will take a train or big ship—or wait for the stratospheric jet. (Doubting Thomases, please note !) A false decision now can put Britain back at the starting post with the U.S.A., so let's not get cold feet on the turbojetted transport—but build 'em bigger, faster and, above all, higher.

Santa Monica, U.S.A. STANLEY H. EVANS.

Shape (Roughly) of Things to Come?

I ENCLOSE a photograph [reproduced here—Ed.] of an 8in span plastic model "Comet" which at present is on sale in most toy stores in the Americas.

As the machine bears U.S. markings, I wonder if this is an indication that C.A.A. are weakening?

Toronto, Canada. IAN C. MORTON.

The "Comet" referred to by Mr. Ian C. Morton in his letter above.

Overpowered and Undercover?

THE article on "soaring" or "gliding" by Kenneth Owen in your October 9th issue was a delightful change from the usual eulogies of the roaring, witless cult of powered "flying." If I were World Dictator, I would imprison anybody who used an engine in his aircraft of more than 25 b.h.p.—which would be permissible, just as a small auxiliary engine is useful to a yachtsman but does not ruin yachting as a fine and socially beneficial pastime. The present insanities of powered "flying" are the products of war-loving psychopaths and their supporting profiteers.

One-tenth of the talent and money now wasted in developing the existing powered "flying" monstrosities could bring about a real Age of Flight for the whole of mankind. The possibilities of engineless flight have only been scratched as yet.

Wyton, Hunts. W. H. CAZALY.

I HAVE two queries concerning Mr. Owen's otherwise excellent article on gliding. Firstly, as in the cockpit check "U" stands for "uncover pilot," why were details of the author's blindfolding and/or cocooning omitted from the narrative ? Secondly, should not "scrubcat" be "scrubcatt,' the last letter indicating "take cover off pitot"?

London, S.E.5. WOLF J. FLYWHEEL.

[Pitots, like pilots, are sometimes confused. Apologies.—Ed.]

Supermarine History

THE Supermarine history printed in the issue of October 2nd, is a valuable contribution to historical records, and I should like, if I may, to add a little and correct a little in the hope that further correspondence may throw more light on the subject.

It seems that Noel Pemberton-Billing maintained a personal series of design numbers (the P.B. series), but that those machines actually built received other numbers (the Supermarine-P.B. series, so to speak.) Thus the beautiful little Supermarine P.B.1 flying-boat was P.B.7 in the "personal" series, and the Supermarine P.B.9, P.B.13 in the "personal" series. There was also a P.B.17 design which was very similar to the Supermarine P.B.9 (P.B.13), but it seemed to have staggered wings.

As you say, the Push Proj appeared in two different versions. The first (P.B.23) had straight wings, and the nacelle appeared to be covered with sheet aluminium : I believe it was known as the Supermarine P.B.11 when built. The second design, as illustrated, was the P.B.25, and had swept-back wings and a fabric-covered nacelle. A small production batch of this version was built.

Your reference to the Night Hawk quadruplane is confused with the earlier Supermarine Quadruplane (P.B.29) which was built in 1915. It was the P.B.29 which had the two 90 hp Austro-Daimler engines : the Night Hawk had two 100 hp Anzani radials, plus an inboard A.B.C. engine as an auxiliary power plant to drive the generators for the searchlight. Unfortunately, no photographs of the P.B.29 seem to have survived, but the fuselage appeared to be of circular or elliptical cross-section, and filled the gap between the two bottom wings. The pilot sat in an open cockpit beneath the third wing; and filling the gap between the two top wings was a "howdah" affair to accommodate a gunner. The Austro-Daimlers were installed as pushers, and each half of the undercarriage had two pairs of two wheels in tandem. There was a biplane tail unit. The P.B.29 crashed at Chingford.

It is hard to believe that two Night Hawks were built. Certainly serial numbers (1388 and 1389) were allotted for two machines, but I doubt whether the second was completed.

The initials A.D. stood for "Air Division" (of the Admiralty), which department was responsible for the basic design of the A.D. flying-boats and of the A.D. Navyplane float seaplane. The standard engine for the A.D. boats was the 200 hp Hispano-Suiza, but at least one (N.1525) had a 150 hp Hispano-Suiza. It was the lower tailplane which was built to be watertight, not the lower mainplane. The reverse-chamber tailplane was by no means unique on flying-boats during the 1914-18 war.

Can anyone tell us something about the experiments with hydrovanes, which were carried out with the A.D. boat N.1719 ? Two hydrovanes were fitted to the hull.

The designs of the Air Division could do well to be aired and examined—if one could find out anything about them. Can anyone throw much light on the A.D. scouts, for example ? Photographs do not seem to exist, but serial numbers 1452 and 1453 were allotted for two machines of that designation to be built by Hewlett and Blondeau; whilst 1536 and 1537 were allotted for Blackburn-built A.D. scouts. Whether the Blackburn and Hewlett and Blondeau machines were identical is uncertain, but I

believe that the Blackburn type was known as the A.D. Sparrow.

And can anyone contribute anything on the Pemberton-Billing Box-Kite? To begin with, was there such a machine? The P.B.15 was a nacelle-and-tailbooms pusher which might have qualified for such a title.

Reverting, if I may, to the subject of the S.E.5: I was not a bit surprised to see the letter from Mr. E. C. D. Malone in the issue of September 25th, in which he made the point that McCudden himself mentions the serial number of his S.E.5 as A/4891. What is not so well known, however, is that the original manuscript of McCudden's book was written in pencil in an ordinary exercise book, and in my opinion it would be entirely possible for someone jotting down things in that way to make a simple transposition of numerals, or to write the prefix letter in such a way as to result in misreading. The number A.4891 falls into a batch of 119 F.E.8s built by the Darracq concern, A.4869-A.4987, and I still think McCudden meant either B.4891 or possibly A.8941. But I doubt whether we shall ever know the whole truth, unless someone can produce a photograph of an S.E.5 with the serial number A.4891 on it!

Birmingham 32. J. M. BRUCE.

[In his book *Defence Against the Night Bomber*, Pemberton Billing himself gives the engines of the Night Hawk as Austro-Daimlers, though he does admit that he was writing "without references."—Ed.]

FORTHCOMING EVENTS

Oct.	23.	Aeronautical Association: Annual Dinner and Dance, Westminster Arms, Page Street, London, S.W.1.
Oct.	28-30.	Institute of Welding: Annual Dinner and London Autumn Meeting.
Oct.	29.	R.Ae.S. Main Lecture: "A Quantitative Study of Instrument Approach," by J. F. W. Mercer, B.Sc., A.C.G.I.
Oct.	30.	R.Ae.S. Graduates' and Students' Section: Informal Reception and Dance.
Nov.	3.	R.Ae.S. Section Lecture: "Development of 4,000 lb Hydraulic Systems," by G. Orloff.
Nov.	5.	R.Ae.S. Graduates' and Students' Section: "Exploration of Space," by Arthur C. Clarke, B.Sc., F.R.A.S.
Nov.	6.	Helicopter Association: Discussion: "The Independent Airline Operator and the Helicopter."
Nov.	6-11.	"Dates" Air Rally, Biskra, Algeria.
Nov.	10.	R.Ae.S. Section Lecture: "Gusts and their Measurement," by J. Taylor, M.A., A.F.R.Ae.S.
Nov.	12.	R.Ae.S. Main Lecture: "Stability and Control in Aircraft Design," by J. C. Wimpenny.
Nov.	19.	R.Ae.S. Section Lecture: "Aircraft Stability and Control," by A. W. Babister, M.A., A.F.R.Ae.S.
Nov.	26.	R.Ae.S. Graduates' and Students' Section: "The Case for the Light Fighter," by P. A. Norman.
Dec.	1	R.Ae.S. Section Lecture: "Integral Construction," by H. G. Legg.
Dec.	4.	Helicopter Association: "Ground Resonance," by R. Howarth.
Dec.	9.	Royal United Service Institution: "Effects on the Human Body of High-speed and High-altitude Flight," by G/C. W. K. Stewart, C.B.E., A.F.C., B.Sc., M.B., Ch.B.

THE B.B.C.'s AIR WAR TELEVISION FILM

AS we reported last week, it has been announced that the ambitious *War in the Air* film under preparation for B.B.C. television is to be broadcast during the winter of 1954-55.

The Corporation have now disclosed details of their planning for the film, which was originally mooted as long ago as 1947. The Government were not then in a position to co-operate. In 1952, the subject was re-opened with the Air Ministry; and in February this year work began with the full co-operation of the Air Ministry, Admiralty, War Office, Ministry of Supply and Central Office of Information. About 3½ million feet of film, drawn from official libraries, have been viewed since that date.

The instalments will be some thirteen in number, each half-an-hour in length, and they will be televised at weekly intervals.

Accommodation has been set aside at Alexandra Palace for the production unit. Its members, working directly under Philip Dorte, Head of Television Films (who was himself a group captain during the war), include John Elliott, an ex-flight lieutenant, the producer; Ray Dicks, senior film editor; and Maureen Taylor, ex-W.A.A.F. section officer, who is doing script research.

One of the most exacting problems encountered, says the B.B.C., has been the cataloguing and indexing of the enormous amount of material available. Outline scripts have been agreed with the Air Ministry, and Air Chief Marshal Sir Philip Joubert is acting as technical adviser during the editing, writing, and recording stages, which will continue throughout the next year.

Although the films will give due credit to all the Allied Air Forces and will include much captured enemy material, they will deal mainly with the part played by the British and Commonwealth Air Forces and will stress Britain's development as an air power both before and since the Second World War.

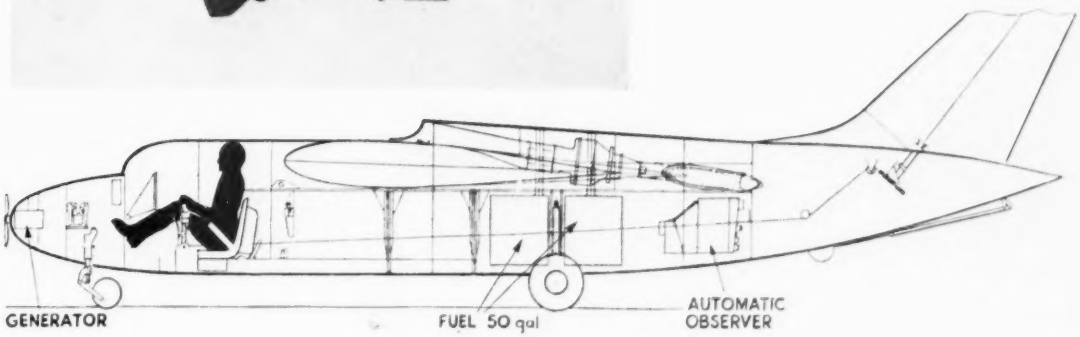
The first instalment will cover the story of the R.A.F. in the inter-war years, including recollections of the Schneider Trophy Races, the airship phase, German resurgence as reflected by Hitler Youth rallies and gliding clubs, and so to the eve of the Battle of Britain.

The second will deal basically with the Battle of Britain, and the beginning of night attacks on London. Part 3 will cover the Battle for Europe and will recall the first 1,000-bomber raid. Subjects to be covered in later films of the series include air operations against U-boats in the Western Approaches; operations in the Middle East; the dam raids; the V.1s and V.2s and the defence of London; and various phases in the liberation of the Continent. The final film in the series will include the most up-to-date glimpses that can be given, within the limits of security, of the present and future potential of British air power.

Judging by this forecast, the series promises to be a truly memorable one. While there is yet time, however, we suggest to the B.B.C. that they would do well to invoke the aid of one or more of those many knowledgeable enthusiasts—the Aircraft Recognition Society could suggest names—with an eagle eye for errors of detail. Only in this way will they be able to avoid slips such as occurred in the (mainly American) *Victory at Sea* television film last winter—e.g., editing errors which put certain types of aircraft into battles in which they never took part.

SHORT'S NEW PRIVATE-VENTURE RESEARCH AIRCRAFT

The Short S.B.4 Sherpa, which was described in our last issue, makes an entirely new, birdlike picture in the air. Something of this quality is apparent in the photograph, taken on the first flight at Belfast. Also visible are the rotary wing-tip controls, of which the port unit is set to initiate either a climb or a bank to port. In the copyright drawing below, the general interior layout is shown; everything is carried in the fuselage, leaving the experimental wing quite unencumbered. The power units are two Blackburn-Turboméca Palas turbojets of 350 lb thrust each.



WHITE CROSSES on red fins, the distinctive Swissair motif help to pinpoint the scene of this photograph—Zurich, where an impressive new terminal building has lately been opened.

CIVIL AVIATION

SIR MILES PROPHESIES

THE chairman of B.O.A.C., Sir Miles Thomas, has been championing the cause of the turbine-engined airliner throughout his recent business tour of Canada. He was in particularly good form at Vancouver last Friday, when his address included the following extracts:

"While some engineers continue to coax piston engines with fuels so rare that they seem to be mixtures of liquid dynamite and fluid gold, and are coincidentally whipping them to give the last dregs of power by dragging at the already tired exhaust gases, the jet engineers are fostering the lusty adolescent that already is gaining strength and stamina with a diet of simple kerosine.

"One jet engine in Britain has recently increased its cruise power from 6,500 to 7,000 lb thrust in less than 12 months, simply through straightforward operating experience. Another turboprop has just completed a test run of 50 hours duty at boosted take-off power and has shown a clean record."

Of the future Sir Miles said: "As I see it, the development of the Comet and its pure jet successors, some possibly of delta form, will provide an established family of British aircraft flying Cordon Bleu services—a fast 550 m.p.h. providing impressive domination over world trade routes; then there will be the turboprop aircraft like the Bristol Britannia—economical long range aerial work horses, flying 450 m.p.h. or more over Great Circle routes and creating new vistas of international travel.

Then, Sir Miles concluded, "there will be developed some form of jet-reaction aircraft that will have near vertical lift for take-off and landing; the design of such revolutionary turbines, something between a helicopter and a fixed wing high-lift aerofoil, may be nearer than some folk imagine; and finally, as atomic power is developed, we shall see it applied, in the next 25 years or so, to long-range flying-boats, great Queens of the Air . . ."

SABENA ACCIDENT

FORTY passengers and the crew of four lost their lives when a Convair 240 of Sabena crashed shortly after taking off from Frankfurt for Brussels on October 14th. The aircraft, OO-AWQ, one of six operated by the Belgian airline, making a scheduled flight from Salzburg, was carrying a full complement of passengers. The crew, commanded by Capt. C. Formal, were all Belgians. Preliminary reports suggest that engine failure contributed to the accident.

Among the passengers was Mr. Lionel Calisch, who for over 30 years had been Continental representative of a firm well known in the aircraft industry, the E.N.V. Engineering Co. Ltd.

FASTEST TO JOHANNESBURG

COMETS of U.A.T., the French independent line, will from November 2nd operate twice monthly on the Paris-Johannesburg route, flying *via* Tripoli, Kano, Brazzaville and Livingstone. The service will be the fastest yet flown between Johannesburg and a European capital. A preliminary flight is scheduled for October 26th, and the fortnightly frequency will begin from the following Monday, November 2nd. It is intended to double the frequency at a later date.

Leaving Paris at 8.40 p.m. on a Monday, the U.A.T. Comet will land at Johannesburg at 4 p.m. (local time) the following day. The average time spent on the ground at each of the four intermediate stops will be 50 min, and the overall flying speed will be over 350 m.p.h. Elapsed times for the three fastest services to Johannesburg—operated by U.A.T., B.O.A.C./S.A.A. and K.L.M.—are respectively 18 hr 20 min, 21 hr 20 min and 25 hr 35 min. As they are Series 1As with extra tankage, the French Comets are able to fly slightly longer stage-lengths (averaging just over 1,100 miles) than those operating the B.O.A.C./S.A.A. services.

CONVAIRS FOR GERMANY?

FOUR Convair 340s are reported to have been ordered for Lufthansa, the projected German national airline, whose revival is dependent on ratification of the Peace Treaty. It is still uncertain whether the final decision has been taken and a

"Flight" photograph

SKYWAYS OF LONDON: In one of the attractive Berkeley Street offices occupied by this major independent carrier are pictured the managing director, Mr. J. Eric Rylands, and A. Cdre. Sidney Smith, contracts manager. The mural, incidentally, is a photographic reproduction of a 17th-century map. On October 30th a Skyway's York will make a proving flight to Cyprus, paving the way for the fortnightly "Crusader" colonial coach service, to be inaugurated on November 11th.

contract signed. Although it was hoped in this country that Lufthansa would buy Viscounts—and it is still too early to dismiss the possibility—the report has not caused despondency; if Convairs have, in fact, been chosen, airlines with the British turboprop airliner will be better equipped to face the impending threat of competition from a revived Lufthansa.

ENTEBBE'S STORM RADAR

SOME details of trials with ground radar designed to detect dangerous clouds within an area of some 450,000 sq miles of Entebbe Airport, Uganda, were given by Mr. R. E. Perry, of Decca Radar, Ltd., in a recent issue of *The Journal of the Institute of Navigation*. Working in the 3 cm band at a frequency of 9,320-9,500 Mc, the radar can detect and display in azimuth a "moderately large thunderstorm" at a range of nearly 80 miles; rather larger storms, says Mr. Perry, are expected to show up at a range of nearly 120 miles. The presence of a storm on or near the path of an incoming aircraft is indicated to the aircraft as a range and bearing from the airport; the pilot can then take avoiding action. No measurement of cloud height is made, since the aircraft flies round the storm and not above or below it; in any case, the type of cloud concerned occupies a deep height interval, with a violent upsurge to perhaps 40,000ft as the storm approaches maturity. The equipment is, of course, particularly valuable at night, when cloud development cannot be watched visually.

In addition to its primary work of giving advance warning of dangerous clouds in the path of aircraft, the radar is expected to provide useful data on the generation and movements of thunderstorms, their intensity, and the turbulence of the cells within them.

JAPANESE EXPANSION

PENDING political approval of Japan Air Lines' trans-Pacific service from Tokyo to San Francisco, the company's newly delivered DC-6B (illustrated above) is being used temporarily on a domestic service. The aircraft, which has been named *City of Tokyo*, flies five times weekly between the capital and Sapporo. According to a Japanese report, no fewer than 120 passengers were carried on a recent demonstration flight over Tokyo. The San Francisco service is expected to begin in the new year.

HELICOPTERS AND THE SOUTH BANK

OCCUPANTS of many offices fringing London River, *Flight*'s included, have in recent weeks become accustomed to the sight of a scarlet-painted helicopter whirring its way towards the South Bank site at Waterloo. The aircraft is the *Evening Standard* S.51 G-ANAL, and approval for it to fly to Central London is, of course, subject to the use of an approach along the line of the Thames as a precaution against power-failure. Its comings and goings not only serve to familiarize citizens with the latest form of transport, but remind us of the need to find a permanent focal point for "BEAbuses" and other rotorplanes of the future.

The South Bank, so useful as a temporary terminal, would be ideal—if it were available. When B.E.A. announced their decision to transfer the coach terminal from Kensington to Waterloo, the move was interpreted in many quarters as being a "foot in the door." Experimental flights to and from the site by B.E.A. helicopters proved its operational suitability, but the London County Council—owners of the property—were quick to emphasize their objection to the idea of a permanent rotorstation. Plans for development of the South Bank in quite another way have, in fact, been under consideration since 1943.

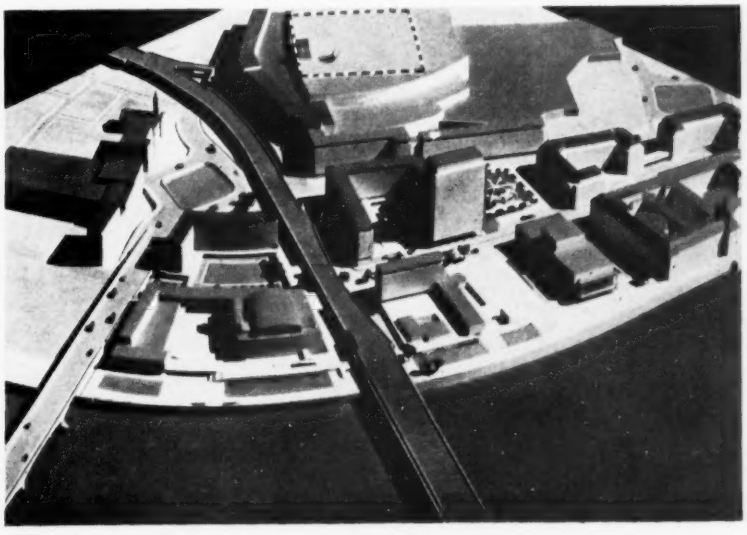
FROM A TO B: Formerly owned by Slick Airways, this latest acquisition of Japan Air Lines is a DC-6A freighter modified to DC-6B standards for passenger work. Another will be delivered to J.A.L. in mid-November.

The master scheme for the South Bank was outlined last week by Mr. I. J. Hayward, Leader of the L.C.C., and described by its chief architect, Dr. J. L. Martin. Briefly, it is proposed to place on the site a National Theatre and exhibition gallery (both complementary to the existing Festival Hall), hotel, conference centre and two office blocks, one of which will be the international H.Q. of the Shell Petroleum Co. The present B.E.A. coach terminal, which is occupied on a seven-year lease, will not be retained, but provision is made for replacing it with a permanent terminal, and this question is under consideration. Coach and car parks will be placed underground, and so would the major portion of B.E.A.'s terminal; the only superficial sign of its presence would be a small circular reception building.

Development on such a scale clearly rules out the prospect of a helicopter terminal on the actual South Bank site. However, the L.C.C. state that the roof of Waterloo Station might be adapted for helicopters, and that "This possibility was favourably regarded by the M.C.A., who took the view that future research might prove it to be a very likely way of meeting the need." It is stressed that this proposal must await more precise knowledge of large helicopters. It seems, therefore, that B.E.A.'s negotiations for a helicopter platform in London will now be conducted with the Railway Executive, with the M.T.C.A. as intermediary.

This project, as the L.C.C. point out, would provide the helicopter passenger with direct access to surface and underground rail and road facilities. It would also meet B.E.A.'s need for close spacing of helicopter and coach terminals. Moreover, the inevitable noise problem would be mitigated by operating from roof rather than street level. On the other hand, there would be a distance of some 400 yd between the rooftop rotorstation and the river, which forms a natural approach; and we notice that a potent obstruction, in the form of a 25-storey building, is to be erected on the South Bank.

While urging the need to find a suitable terminal for the helicopters which may become the major link between London and a score of cities at home and abroad, one must respect the L.C.C.'s "cherished ideal" of developing the South Bank. At present B.E.A. are not in a position to agitate for this or any other section of Central London. It would be unreasonable to demand that valuable space be sterilized indefinitely while the helicopter's value as a transport vehicle is determined. Clearly, this cannot be measured by the machines now in service, and much depends on results of trials with the Bristol 173 and still larger rotorplanes now under development.



AIR-RAIL STATION: Plans announced by the L.C.C. last week for development of the South Bank exclude the possibility of a helicopter platform on the site. The roof of Waterloo Station, it is suggested, might be adapted to meet London's future need for a heliport. In this model of the developed area, dotted lines enclose the station roof (top) and the reception building for the B.E.A. coach terminal, the main portion of which will be underground.

CIVIL AVIATION . . .

ATLANTIC TO SYDNEY?

ONE of Avro's directors, Mr. J. A. R. Kay, recently discussed the performance of the delta-winged Atlantic airliner project in relation to the U.K.-Sydney route. He said that "a flying time of 20 hr for the journey from Sydney to London is well within the capabilities of the Atlantic. This includes a non-stop flight between Sydney and Singapore of 7¼ hr against a 50 m.p.h. headwind." Although tentatively named the Atlantic, the aircraft would have an outstanding performance on all stages upwards of 1,500 miles. To complete the London-Sydney route in 20 hr flying time, the Atlantic would have to cruise at well over 520 m.p.h.

R. K. DUNDAS APPOINTMENT

SOME changes are announced in the structure of the Indian and Pakistan sales organization controlled by R. K. Dundas, Ltd. Management of the Bombay company—R. K. Dundas Eastern, Ltd., which is reported to be expanding to New Delhi and Calcutta—is now in the hands of Mr. John Orsman. He succeeds Mr. E. A. King, who has relinquished his appointment with the company. It is also announced that R. K. Dundas Eastern, Ltd., in Bombay, and R. K. Dundas Pakistan, Ltd., in Karachi, will henceforth operate as separate units under the ultimate control of the head office at 29 Bury Street, London, where the aviation interests of the three companies and the South African Branch are cared for by Mr. Alex Duncan.

BREVITIES

ACCORDING to statistics on Sunday bus and coach excursions run by London Transport, the visitors' enclosure at London Airport has become the most popular attraction in the London area. Some 23,000 people made these excursions to L.A.P. this summer, compared with 18,000 trippers to Windsor and 15,500 to Whipsnade Zoo.

* * *

Qantas announce the appointment of a new sales superintendent for the United Kingdom and Europe, Mr. G. Geikie, who for the past four years has filled similar appointments in the Far East and Australia. He succeeds Mr. Don Maitland, who is returning to Sidney after 2½ years in London.

* * *

To meet a heavy demand for seats to the Middle East and Persian Gulf, an extra Comet service to Cairo was operated by B.O.A.C. on Sunday, and an additional Comet flight to Bahrain is due to be made tomorrow. Bookings on the South African route are also heavy, and an extra Constellation tourist flight, operated by S.A.A., was scheduled to leave for Johannesburg today.

* * *

Douglas DC-6Bs will replace DC-4s on Pan American routes connecting Seattle with various points in Alaska next year. Making this announcement, PanAm say that DC-6Bs—"most modern of high speed transport planes"—will reduce flight times by an average of 25 per cent. That PanAm, of all American airlines, should make such a claim for the DC-6B is surprising, since they are the first and only U.S. operator to order Comets.

CLUB AND GLIDING NEWS

ORGANIZATION of the 1954 World Gliding Championships, which are to take place at Great Hucklow from July 20th to August 3rd, has already commenced. Twenty countries have provisionally agreed to send teams; they are Argentine, Austria, Belgium, Brazil, Denmark, Egypt, Finland, France, Germany, Great Britain, Iceland, Israel, the Netherlands, New Zealand, South Africa, Spain, Sweden, Switzerland, U.S.A., and Yugoslavia. John Furlong is chairman of the B.G.A.'s master committee concerned with the contests, while detailed work is being performed by several specialist sub-committees, and by a local organizing committee of the Derby and Lancs. Club. Basil Meads, chairman of the club, is chairman also of the committee, whose secretary is Eric Taylor.

At the same time as the championships, the fifth congress of OSTIV (the International Scientific and Technical Organization for Soaring Flight) will take place in Buxton. President of the research organization, Mr. L. A. de Lange of the Netherlands, recently visited Derbyshire in order to discuss arrangements that will be made for the congress (see picture below).

TALKING OF WORLD GLIDING, in Derbyshire recently, were (left to right) Eric Taylor, L. A. De Lange (president of OSTIV) and Basil Meads (see paragraph above).

AT CLERMONT-FERRAND, a recent national flying meeting featured a Minicab demonstration by the well-known French pilot and writer, Jaques Noetinger, seen here before take-off.

AT Ringway Airport, Manchester, membership of the recently formed flying club for B.E.A. and airport personnel now totals 40. Rates for dual or solo flying in the club's Autocrat do not exceed £2 5s per hour. Men behind the club are Mr. Leslie Jones, Mr. T. Healey (B.E.A. chief engineer) and Mr. C. Erridge (Area Manager), respectively secretary, chairman and president of the club, the formation of which was originally suggested in 1951. The chief flying instructor is Mrs. G. M. Patterson (an ex-A.T.A. pilot), three B.E.A. pilots are training for instructors' endorsements, and in charge of all flying operations is Mr. R. Preston.

HOLDER of his country's altitude record for gliders (14,000ft) obtained last April, F/L. V. Bhatnager, C.F.I. of the Delhi Flying Club, gained a new Indian gliding endurance record last month. Flying an Olympia, he remained airborne for six hours 11 minutes.

R.Ae.C. PILOTS' CERTIFICATES AWARDED, SEPTEMBER 1953

No.	Name	Class	Date
28,518	G. E. Bell	2	8.9.53
28,519	Miss K. Darker	2	8.9.53
28,520	V. V. D. Hewitt	1	8.9.53
28,521	S. H. A. Mirza	3	10.9.53
28,522	C. D. Weston	4	22.8.53
28,523	A. C. Witts	2	18.9.53
28,524	G. W. Coburn	2	18.9.53
28,525	F. A. Castillo	4	23.9.53
28,526	P. D. Bird	1	30.9.53
28,527	M. A. Harlé	1	30.9.53

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

No. 7 Sqn. Standard Presented

AT a ceremony held recently, No. 7 Squadron received its Sovereign's Standard; it is the first unit of Bomber Command to be so honoured.

In the fear—ultimately unjustified—of bad weather, the parade was held under cover, in a hangar draped in red and sky blue and with squadron crests as decorations. Prominent among these was the squadron's old badge, used before the College of Heralds insisted upon a standard style.

The presentation was made by Marshal of the Royal Air Force Sir John Salmond, G.C.B., C.M.G., C.V.O., D.S.O., D.C.L., LL.D., who, in May 1914, was the unit's first commanding officer. He must have been extremely proud of them at the ceremony, for their drill was perfect. Equally effective was the "stage management." On arrival, No. 2 Regional Band, R.A.F., and the squadron marched in through the centre doors; but at the conclusion of the ceremony the squadron, with its new standard flying, marched up to the end of the hangar, the doors of which opened only as the leading files arrived.

Large numbers of old members of No. 7 Squadron were present and many of the officers from other units, which are also stationed at R.A.F. Upwood, lent a hand in ushering the guests.

Provosts for Ternhill

IT is announced that No. 6 Flying Training School, Ternhill, Shropshire, is to become the first school to instruct R.A.F. student pilots with the Percival Provost. The new training programme has already begun and two flights are equipped with the new aircraft. The change-over will be completed early in the New Year and Ternhill will be the first complete Provost equipped flying training unit in the R.A.F.

The history of Ternhill goes back to the days of the R.F.C. It was first opened as an operational base in 1916 but closed in 1920. During the expansion of the R.A.F. in 1935 it re-opened as a flying training school and the first course commenced in February 1936. Although there have been several different units at Ternhill it has always been the home of an F.T.S.

No. 6 F.T.S. was formed in May 1920, when a nucleus of the unit was established at Spitalgate, Lincs. In September 1921, the school moved to Manston, Kent, as a lodger unit of the School of Technical Training, with S/L. J. T. Babington, D.S.O. (later to become a member of the Air Council), and S/L. W. S. Douglas, M.C., D.F.C. (now Marshal of the Royal Air Force the Lord Douglas of Kirtleside) as squadron commanders. The school then was largely concerned with refresher courses for officers who already had their "wings." In April 1922, however, the school closed.

As part of the R.A.F. expansion of the mid 1930s, No. 6 F.T.S. was re-formed at Netheravon, Wilts., in April 1935 but in August 1938, it moved to Little Rissington, Glos. At the outbreak of the last war its title changed to No. 6 Service Flying Training School and the courses were shortened and the pupil establishment increased to 160. When new schools were set up in the Dominions under the Empire Air Training Scheme, No. 6 S.F.T.S. at Little Rissington, in April 1942, was reorganized into No. 6 (Pilot) Advanced Training Unit to deal with the products of the Canadian schools. In December 1945, No. 6 (P) A.F.U. was re-formed into No. 6 (S) F.T.S.

From 1935 until February 1942, when it became a P.A.F.U., No. 6 F.T.S. passed out some 2,016 pilots. During the World War II, ex-pupils of the school won 588 awards for gallantry, including the V.C. gained by W/C. Guy Gibson, the D.S.O. won by W/C. J. J. K. Fleetwood for locating the prison ship *Altmark*, and 23 Allied awards.

"Flight" photographs

STANDARD PRESENTATION: (Top right) F/O. D. G. Gibbons with the new No. 7 Squadron Standard after presentation by Marshal of the R.A.F. Sir John M. Salmond. In the background is S/L. D. C. Saunders, who commands the unit. (Above) Sir John Salmond arrives in a D.H. Devon, to be greeted by the Station Commander, G/C. R. A. C. Carter, D.S.O., D.F.C. (Right) Marching-off the Standard at the end of the parade; it is between A Flight, commanded by F/L. H. I. Popay, D.F.M., and B Flight, commanded by F/L. D. H. Tew. F/S. W. D. E. Martin and F/S. W. T. Ball formed the Standard Escort.

SERVICE AVIATION . . .

Sir Robert Brooke-Popham

AS we go to press we learn with deep regret of the death, in the R.A.F. Hospital at Halton, of Air Chief Marshal Sir Robert Brooke-Popham, who before the First World War commanded No. 2 Company of the Air Battalion of the Royal Engineers, the first Army unit to have aeroplanes. In the Second World War he had command of the land and air forces —later admitted to have been inadequate in numbers—in Malaya, Burma and Hongkong during the Japanese attack in 1941. He was 75 years of age.

Homeward Less Quickly

THE three R.A.F. Canberras which gained first, third and fourth places in the England to New Zealand Air Race are to pay a series of official visits in Australia, Siam, Burma, India and Pakistan on their way home to England. They are at present visiting R.N.Z.A.F. Stations in New Zealand. The three aircraft will be joined in Singapore by a fourth Canberra piloted by S/L. Press, who had to withdraw from the race at the last moment, and by a Hastings carrying ground crews from the Air Race Flight at Wyton.

Sir John Slessor at R.E.S.

IN an address before the Royal Empire Society on October 8th, Marshal of the Royal Air Force Sir John Slessor said that he considered a third world war unlikely. In this age, he said, it was out of the question to create conditions after a war more favourable to anybody than those preceding it. If, however, a third world war did develop he considered that atomic weapons would certainly be used. Yet, though it was realized that atomic warfare would constitute general suicide, the abolition of atomic armament would remove the greatest deterrent to war. Small actions like "Crimeas and Koreas" would characterize the coming generation, but the prevention of "total shooting war" depended upon the West's maintaining its technological and scientific lead and maintaining air-striking superiority. In this latter connection he forecast that the V-bombers would be the last of their type.

Air Marshal Sir Thomas Elmhirst

FOR the first time, a retired senior officer of the R.A.F. has been appointed Lieutenant Governor of the island of Guernsey. In a ceremony held in the Royal Court House at St. Peter Port, Air Marshal Sir Thomas Elmhirst was sworn in as Lieutenant Governor on 16th October. Lieutenant Governors have hitherto been appointed from the army.

VISITOR FROM BRITAIN: While in Melbourne, Air Marshal Sir Ronald Ivelaw-Chapman, Deputy C.A.S.—now visiting air bases of the British Commonwealth—called on Air Marshal Sir Donald Hardman, R.A.F. (right), who is acting as the R.A.A.F. Chief of Staff.

INTERNATIONAL CO-OPERATION: The United States Navy tanker "Elokomin" refuels the Canadian carrier H.M.C.S. "Magnificent" off the Newfoundland coast during Exercise "Mariner."

The Esher Trophy

THE Esher Trophy, awarded annually to the most efficient fighter squadron in the R.Aux.A.F., has been won this year by No. 610 (County of Chester) Squadron. The Earl of Limerick, chairman of the Council of T.A.F.A., presented the trophy to S/L. J. E. Storrar, D.F.C., at R.A.F. Hooton Park, Cheshire, on October 10th. Present at the ceremony were Viscount Leverhulme, T.D., Lord Lieutenant of Cheshire and Honorary Air Commodore of the Squadron; Air Marshal Sir Dermot Boyle, A.O.C.-in-C. Fighter Command and A.V-M. R. L. R. Atcherley, A.O.C. No. 12 Group.

B.A.O.R. v. 2nd T.A.F. Match

ON October 8th and 9th at Sennelager, Germany, a shooting match took place between the B.A.O.R. and the 2nd T.A.F. rifle associations. Conditions were as for the Queen Mary, Inter-services Rifle XX and Revolver VIII competitions. An Allied team from No. 83 Group included Lt. Gillet and 25 officers and men from the 2me Wing de Chasse at Florennes. An excellent shoot in perfect weather was enjoyed. B.A.O.R. won two of the three events; the prizes were presented by A.V-M. W. G. Cheshire.

No. 2 Squadron Standard

THE first unit of 2nd T.A.F. to receive its Sovereign's Standard is No. 2 Squadron and the presentation is to take place on Saturday, October 31st, at R.A.F. Wahn, Germany. All ex-members are reminded that accommodation is available and they are requested to get in touch with the Adjutant, No. 2 Squadron, R.A.F. Wahn, B.A.O.R. 19.

Exercise "Flamingo"

THE year's major Anti-Aircraft Command defence exercise, involving 7,000 troops, including 4,000 Territorials and 700 members of the W.R.A.C., was held on 17th and 18th October. Despite widespread rain and fog in the south of England, the exercise was successfully completed. The coastal defences of the north-western approaches were tested in another exercise on 17th October, in which Royal Marine Reserve Forces attacked improvised coast and river defences in the Merseyside area. The defences were manned by local volunteer forces.

R.A.F. Middle East Command

ON October 16th Air Marshal C. B. R. Pelly arrived in Ismailia, Canal Zone, to take over command of the R.A.F. Middle East. The previous commander in chief was Air Marshal Sir Arthur Saunders.

Reunions

IT has been decided that, owing to lack of support, a No. 70 Squadron dinner will not be held this year. It is hoped that the function will be resumed in 1954.

The 7th Annual Reunion of Nos. 50 and 61 Squadrons will be held at the New Inn, Westminster Bridge Road, London, at 6 p.m. on November 14th. Tickets, price 8s 6d, from Jack Lascelles, 15, Crantock Road, Catford, London, S.E.6.

Members of No. 4 Wing and No. 7 Squadron, R.N.A.S., serving at Dunkirk in 1914-18 are invited to join in the annual dinner of No. 14 Squadron R.N.A.S. and No. 214 Squadron R.A.F. The function will take place on November 21st, at the Mapleton Restaurant, Coventry Street, London, W.1, at 7 p.m. Particulars from G. Conley, 62, Nightingale Lane, London, S.W.12.

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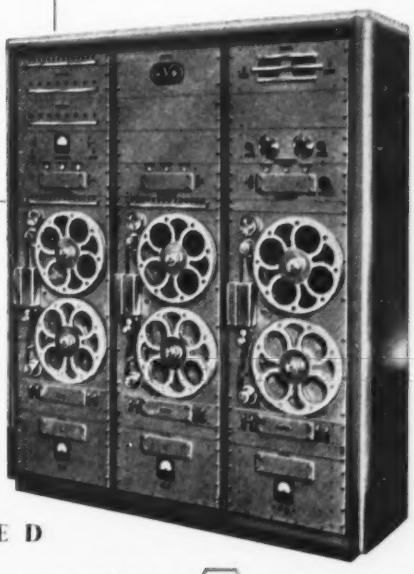

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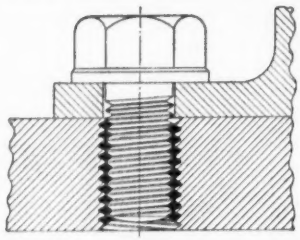

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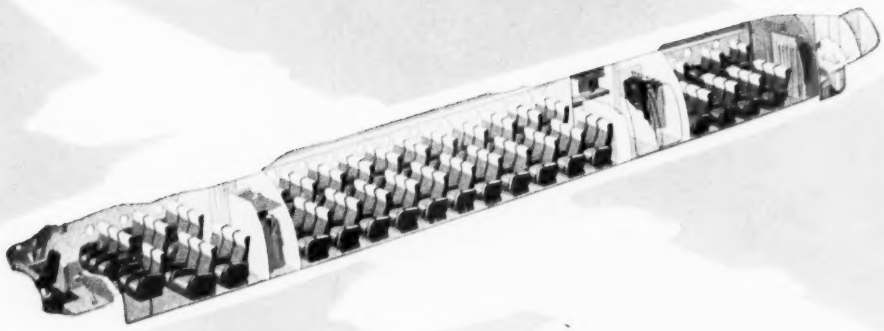

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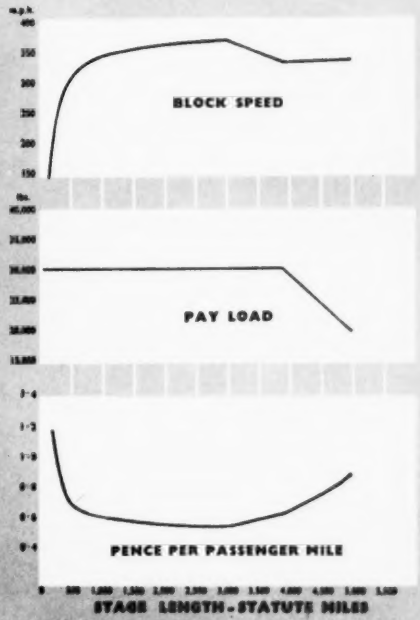

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